October

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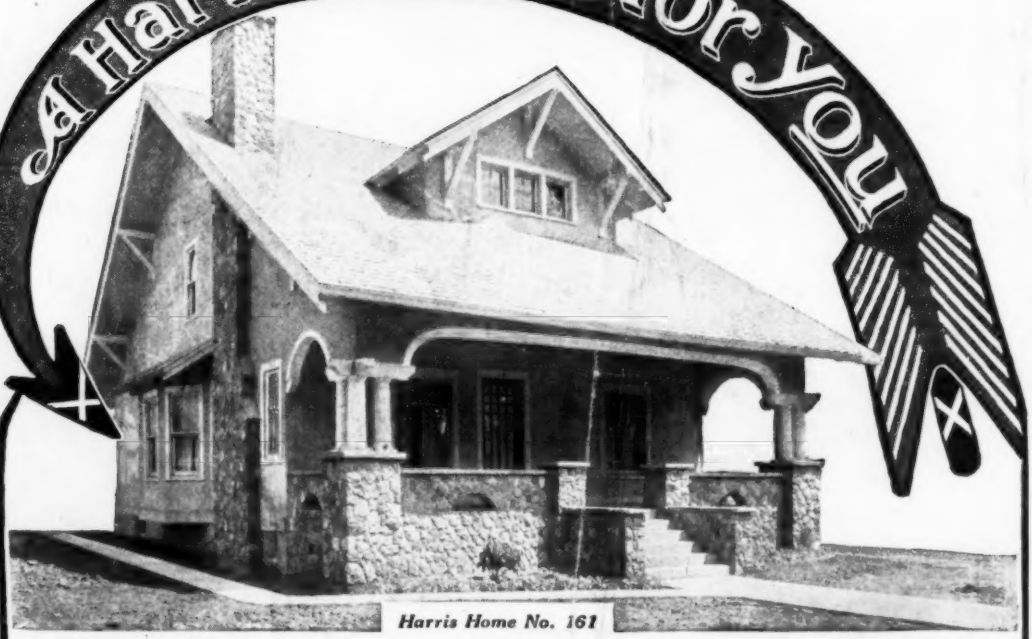
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

A Harris Home for You



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Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 22 OCTOBER, 1914 No. 4

Queer Gun Tacks Signs on Building Walls

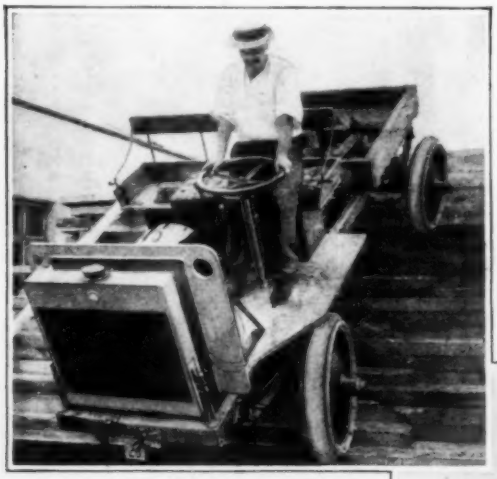
IN advertising campaigns of wide scope in which many small outdoor signs are used, the usual process of tacking them to the walls of buildings, telegraph poles, and trees is slow and often requires a small army of men. To facilitate this work and accomplish it in a minimum of time, besides eliminating the necessity of transporting cumbersome paraphernalia, a gun which shoots the signs into place has been invented. In appearance it is not unlike a shotgun. The sign which it discharges is rolled tightly about a heavy stick and a cord is attached to a tack which is temporarily fastened, point out, at one end of this. The other end of the string is fastened to the top of the sign. When the instrument is loaded with one of these and the

Posting Signs on Buildings and Telegraph Poles is Made a Quick Operation with This Gun, Which Does the Work in a Moment's Time and Eliminates the Necessity of Climbing Ladders and Driving Tacks

trigger pulled, heavy springs furnish the propelling force which sends the roll endwise through the air like an arrow, at whatever object it is aimed. The tack imbeds itself, while the jar of the impact loosens the sign and makes it unroll, falling into place. Posters have been placed at heights of 30 ft. from distances of 50 ft. and more with this unusual gun.

MOTOR TRUCK DRIVEN OVER LUMBER PILE AS TEST

Climbing up the side of a lumber pile was the unusual test imposed upon a new type of machine by its manufacturers. The purpose of the trial was to demonstrate the power of the car and substantiate also the claim that it could perform any service which could be accomplished by a four-mule military-escort wagon. The timbers were laid on approximately a 30-per-cent grade and formed a rough flooring for the wheels, which assisted the truck in one way and made its work all the harder in another, as with each turn the wheels had to be pushed over obstacles. No severe trouble was encountered by the machine in performing the feat. It climbed the pile readily and then slowly descended on the other side. The truck has shaft drive to each of its four wheels and is of 32 to 40 hp. It is of the 1½-ton type, and the weight of its chassis is 4,800 lb. There are two sets of brakes attached to the front and rear wheels, both operated by pedal and lever.



The Car was Held Back by Two Sets of Brakes Applied to Both Front and Rear Wheels

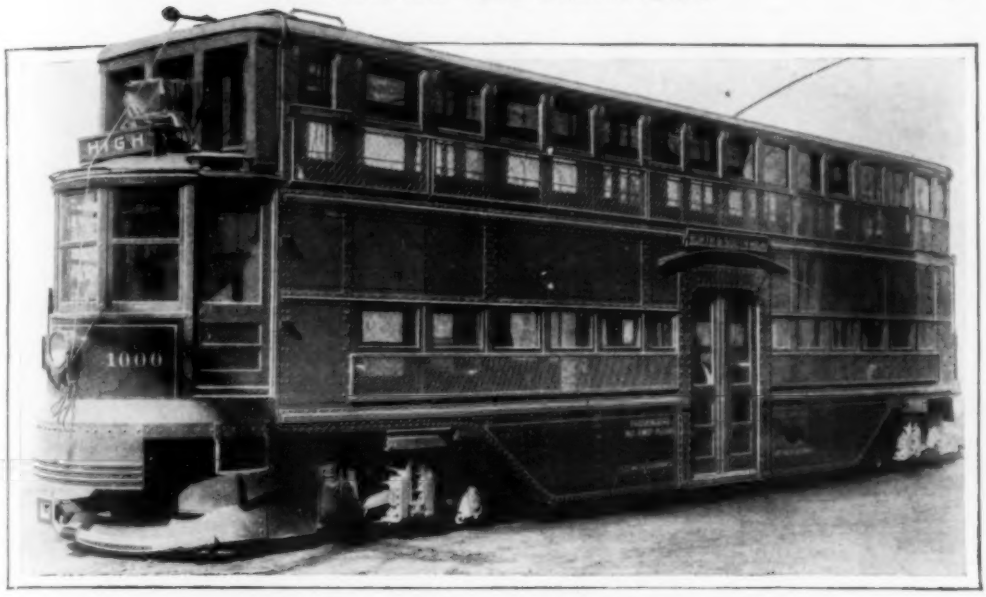
Driving Motor Truck Up Wood Pile to Show Effect of Four-Wheel Drive

MOLYBDENITE DEPOSITS IN TASMANIA

The mining of molybdenite gives promise of becoming an important industry in Tasmania, where extensive deposits of this rare mineral have recently been found. Molybdenite is used for a variety of purposes, but its principal value is in the manufacture of steel, to which it gives a hardness and toughness that makes the steel suitable for use in propeller shafts, guns and boilers. Most of the molybdenite produced in Tasmania is shipped to England. The present market value is about $2,500 a ton.

DOUBLE-DECKED STREET CAR USES SAFETY DEVICES

Having a capacity for seating 80 persons, a double-decked street car has been put in service at Columbus, Ohio. Safety devices have been carefully worked out so that it is practically impossible for an accident to occur while passengers are being taken aboard or

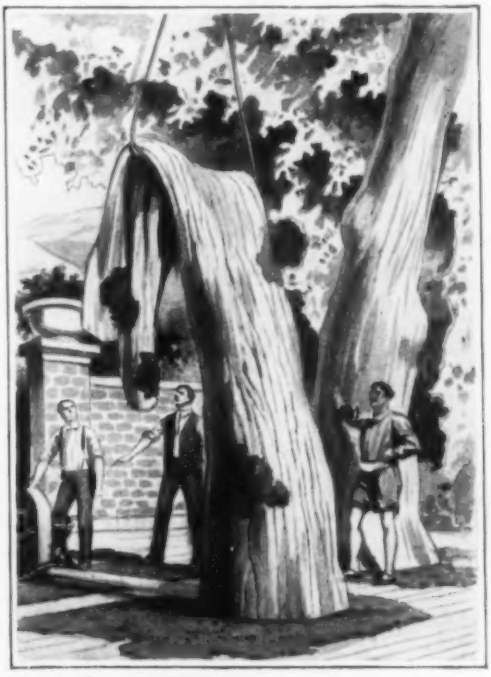


Double-Decked Car Which Eliminates Rear-Step Accidents

discharged. The floor is only 11 in. from the pavement, which eliminates entirely the necessity of a step. Passengers enter and leave the car through doors in the middle. It is not possible for these to be opened by the conductor until the car has come to a complete stop, while on the other hand an electrical appliance makes the motorman unable to start the car until they are closed. In this way the danger of rear-step mishaps, which constitute a large percentage of the personal-injury claims, is removed. Although heavy and necessitating a full stop whenever passengers are taken on, the car has been able to maintain its schedule without difficulty.

PNEUMATIC SCENERY BUILT FOR GERMAN STAGE

In an endeavor to embody more of the realistic in stage settings, and at the same time conserve the features of portableness of the commonly used canvas hangings, pneumatic scenery has been built and introduced in Germany. This is made of a substantial air-tight fabric so arranged that it may be inflated quickly and then collapsed and packed in a minimum of space for shipment at the close of an engagement. The idea has been used in reproducing trees on the stage, the result being that the scenery appears very real from a short distance.



Besides being Realistic the Inflated Settings are Easy to Ship

THE CANAL ZONE IS FORTIFYING ITS RIGHT TO THE TITLE OF "HEALTHIEST SPOT ON EARTH"

LOOK at a map of the Canal Zone. There, at each end of the strip of territory ceded to the United States by the Republic of Panama, may be seen a patch in a different color. One of these patches is labeled "Colon," the other "Panama." These two cities, although lying territorially within the Canal Zone, are not a part of it but of the Republic of Panama.

So far as the protection of the public health is concerned, however, the United States exercises absolute authority over these two cities under a foreign flag. Everyone knows the story of the cleaning up of the Canal Zone, which alone made the construction of the canal possible. It was one of the conditions imposed that the cities of Colon and Panama must be included if sources of possible infection were to be properly controlled. Now the canal is finished, the sanitation of these cities has become even a more important problem, in view of the prospective influx of shiploads of sight-seers from every quarter of the globe and possible contagions brought by cargo carriers from plague-ridden ports. The canal authorities have established by the record of vital statistics the claim that the zone is today the healthiest spot on earth. There are those, however, who have feared, that under the new conditions just coming into operation, the Panama city of today might succeed to the unenviable title which old Panama held unchallenged for four hundred years—"The Pest Hole of the Tropics." To insure against such a calamity the Panama Health Officer is now carrying out in the cities a campaign of personal, domestic, and community sanitation that covers every detail of possible contacts between the inhabitants of the city and the visiting stranger.

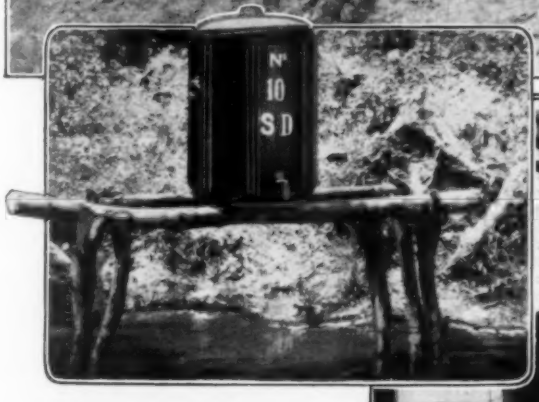
No longer will the noses as well as the eyes of passers-by in Panama streets be offended by the heterogeneous collection of containers set out to await the arrival of the garbage wagon; their contents reeking in the tropical heat and as often as not scattered on the pavement by the upsetting of the can. Every property owner in Panama has been ordered to equip his premises with a type of garbage can specially devised for the purpose. Each can is 19 in. in diameter and 25 in. high, of galvanized sheet metal, and provided with a self-closing wooden cover. The can must be set on a concrete base, 2 in. high, and the cover hinged to the wall behind it, with a stop that prevents it from remaining open. Three garbage collections are now made every 24 hours in the business district, two in other sections, and at least one in every other part of the city. Moreover, a garbage collector who handles containers so roughly as to damage them is subject to a substantial fine.

For the control of restaurants, bakeries, and other places where food is sold or handled, the score-card system used successfully in many American cities has been adopted. Each sanitary requirement is rated at a certain percentage of the perfect score of 100. For example, absolute freedom from flies, cockroaches, and other insects, gives a bakery 12 points toward a perfect score. Cleanliness of tables and furnishings counts 10, or less, in proportion to the degree of dirt.

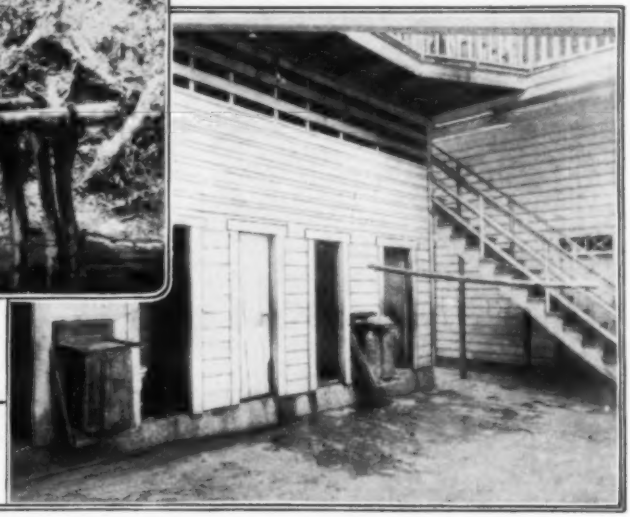
Left: Draining the Swamp Lands and Burning Underbrush to Safeguard Against Fever

Right: Garbage Cans are Placed on Concrete Bases So Dirt cannot Accumulate beneath Them

As a Precautionary Measure the Contents of Garbage Wagons are Sprayed with Chemicals Which Destroy Odors and Repel Flies



Above: Drip Barrels Spread Oil over Stagnant Pools and Streams, Exterminating Mosquitoes



Right: Garbage Cans Not Placed on Concrete Bases must be Several Inches from the Ground

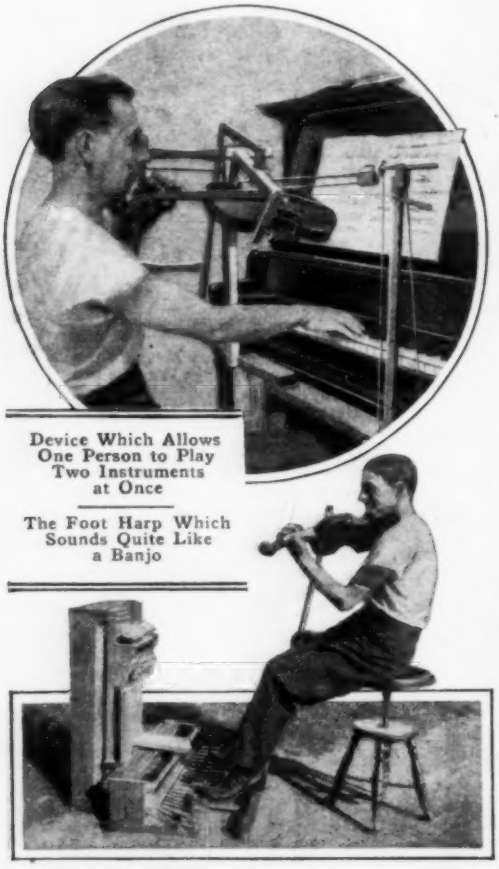
Light, ventilation, tightness of floors, ceilings, and walls; storage facilities, personal cleanliness, transportation methods, and many other conditions, are considered, and no place that scores less than 50 may remain open to the public.

To the approved methods of milk inspection the Panama Health Officer has added a service of experts that will insure against the introduction of milk from tuberculous herds. For the public good, arrangements have been made to sell larvacide to residents of Panama and Colon at cost. And the vaccination campaign in Panama has been extended to include the adult population.

The Canal Zone is fortifying its right to the title of "The Healthiest Spot on Earth."

PLAYS PIANO AND VIOLIN AT SAME TIME

Feeling the necessity of an accompanist when he desired to play his violin, and being unable always to obtain the services of one, the keeper of a country hotel in a small Ohio town devised an apparatus which enables him to play a violin and piano at the same time. A wooden framework which fits before the piano holds the violin in position, and by a series of foot levers provides for the manipulation of the bow. The strings of the instrument are played with the left hand, while the right hand and one foot are used in playing the piano accompaniment. Another musical device made by the man consists of a "peda-harp," as he calls it, which he plays with his feet at the same time his hands are busy with the violin. This develops music similar to that of a banjo.



Device Which Allows One Person to Play Two Instruments at Once

The Foot Harp Which Sounds Quite Like a Banjo

AERIAL BRANCH OF SIGNAL CORPS IS ORGANIZED

Under the new law which establishes a distinct aviation branch in the Signal Corps of the United States Army, 12 officers and 40 men, who already have qualified for the service, will form the nucleus about which it is hoped eventually to build a force of trained aerial scouts that will compare favorably with those of other powers. All the officers were picked after demonstrating their ability to fly under conditions which might reasonably be encountered in time of war, qualifying themselves as junior military airmen, while several of them hold contest medals and cups won at various times. First lieutenants entering the flying service will be promoted to the rank of captain, and second lieutenants will become first lieutenants. It has been decided that other officers who have not proved themselves airmen will go into the branch as students upon rec-

ommendation and at the end of the year be required to submit to an examination. Those who have been enlisted with the First Aerial Squadron will be transferred to the aviation branch.

GAS-EXPLOSION PUMP FOR EGYPTIAN DRAINAGE

The type of pump that operates by the explosion of a mixture of gas and air directly against the water has proved so successful in actual operation that it is now to be installed by the Egyptian government for draining Lake Mareotis at Mex, near Alexandria. When completed, this plant will be one of the largest pumping installations in the world, consisting of 18 pumps, each capable of delivering 100,000,000 gal. of water a day through a lift of 20 ft. This pump, which was described and illustrated in the June, 1913, issue of this magazine, has no pistons or other machinery parts. The water is raised by the force of the explosion in a combustion chamber, the chamber is then emptied of the products of combustion, and the next charge is compressed by the successive surges of the water following each explosion. The pump works automatically at the rate of about nine explosions a minute.

PORTABLE MOVIE PROJECTOR HAS NEW FEATURES

Having an aggregate weight of only 25 lb., a portable motion-picture projector which may be packed in a carrier less than twice the size of a suitcase, and which is adapted to both commercial and schoolroom use, has been produced.

When connected with an ordinary electric-light circuit, this convenient apparatus at a distance of 40 ft. from a screen, will throw a clear picture 10 ft. square. Because it is completely fireproof, it is possible for the operator to stop the film at any point and display a still picture for as long a time as is desired. It may also be reversed, or backed up, in order to display for a second time a portion of film already run. The illuminating source is a

The Movie Machine Which may be Operated by an Inexperienced Person

Portable Projector Weighing 25 Pounds Packed in Small Case

nitrogen-filled incandescent lamp instead of the customary arc. Double choke rollers in the mechanism box and magazines are designed to prevent combustion in the latter, even if the film passing before the lens were accidentally ignited.

REPAIR TRUCK IS BUILT FROM OLD STREET CAR

A mechanic connected with an electric railway at Madison, Wis., recently converted an antiquated street car into a serviceable repair car which is now being used on the system. A floor was constructed on the roof of the car and this was made to carry the tower rigging for a lifting platform which may be raised to a height of 26 ft. As this is hoisted or lowered, the ladder which extends to it adjusts itself automatically. The car is able to carry a large number of workmen, may be rushed within a few minutes to a point where it is needed, and transports all the tools and small materials ordinarily needed in emergency repair work.

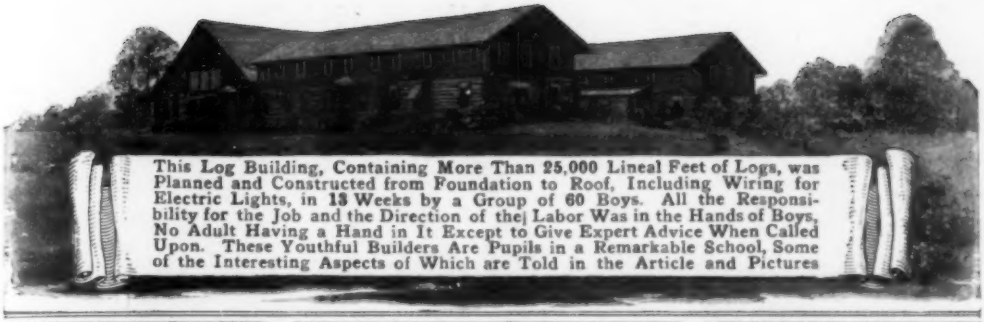
NORWEGIAN CROSSES NORTH SEA IN MONOPLANE

Making the longest flight over water out of sight of land ever accomplished, a Norwegian explorer and airman recently drove a Bleriot monoplane from Cruden Bay, Scotland, across the North Sea to Klep, Norway, a distance of 320 miles. The run was made in an almost straight line from shore line to shore line and the landing effected within a half mile of the position where it had been intended to alight. The trip was completed in just 4 hours 10 minutes, making the speed average almost 77 miles an hour. In preparing for the voyage, the airman provided a bottle of coffee and brandy, a few biscuits, a camera, compass and telescope. His first start was made early in the morning, but after going about 20 miles to sea he encountered fog which necessitated his return to the shore of Scotland. At about one o'clock in the afternoon he made his second attempt, which resulted successfully. Last year a French airman flew 500 miles across the Mediterranean in slightly less than eight hours. This trip, however, included 170 miles over the Island of Sardinia, giving the more recent accomplishment the distinction of being the longest flight out of sight of land.

SINGLE-FUNNEL WARSHIPS BECOMING NECESSARY

The character of the armament of modern warships, which more and more requires a deck arrangement as unobstructed as possible, is having a direct effect upon the number of funnels carried by the vessels. It was possible in the cases of the U. S. battleships "Oklahoma" and "Nevada," through the adoption of oil fuel, to group all the boilers under one stack. While the same thing has been attempted in certain instances in the British navy, it has been found impossible in some classes of ships, while in other of the boats it has been necessary in order to get a satisfactory arrangement with the four center-line turrets. The original ships of the heavy dreadnought class to employ a single funnel were the Spanish warships of the "España" type.

¶German match factories are urging the government to take over their establishments and form a state monopoly.



This Log Building, Containing More Than 25,000 Lineal Feet of Logs, was Planned and Constructed from Foundation to Roof, Including Wiring for Electric Lights, in 13 Weeks by a Group of 60 Boys. All the Responsibility for the Job and the Direction of the Labor Was in the Hands of Boys, No Adult Having a Hand in It Except to Give Expert Advice When Called Upon. These Youthful Builders Are Pupils in a Remarkable School, Some of the Interesting Aspects of Which are Told in the Article and Pictures

TRAINING BOYS FOR REAL LIFE

By

FRANK PARKER STOCKBRIDGE

A GROUP of log buildings on the edge of the woods, built by the boys themselves, houses the school whose motto is: "To teach boys how to live." Here, on the shores of a beautiful little lake in northern Indiana, a hundred and fifty city boys are gaining the sort of education which can be had only through intimate personal

Shoveling Sand for the Concrete Work on a New Building

Felling a Tree for One of the Log School Buildings

Two-Boy Cabins Where the Older Pupils Live in the Woods near the Lake. These Also are Built by the Boys

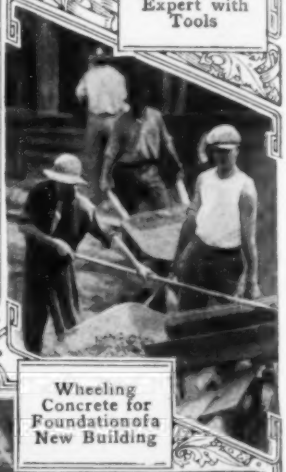
contact with nature and raw materials and the primitive processes of the handicrafts—the education that the farm boy absorbs without realizing it, but for which the city school offers no substitute.

Life at the school is almost primitive in its simplicity and freedom from irksome restraints. Not only have the boys actually constructed the buildings, many of them quite large, but the care and maintenance of the school premises are entirely in their hands. Many of the older boys live in pairs in little cabins built by themselves along a path by the lake—with a kennel for a pet dog at the back of most of the cabins. The "housekeeping" of these

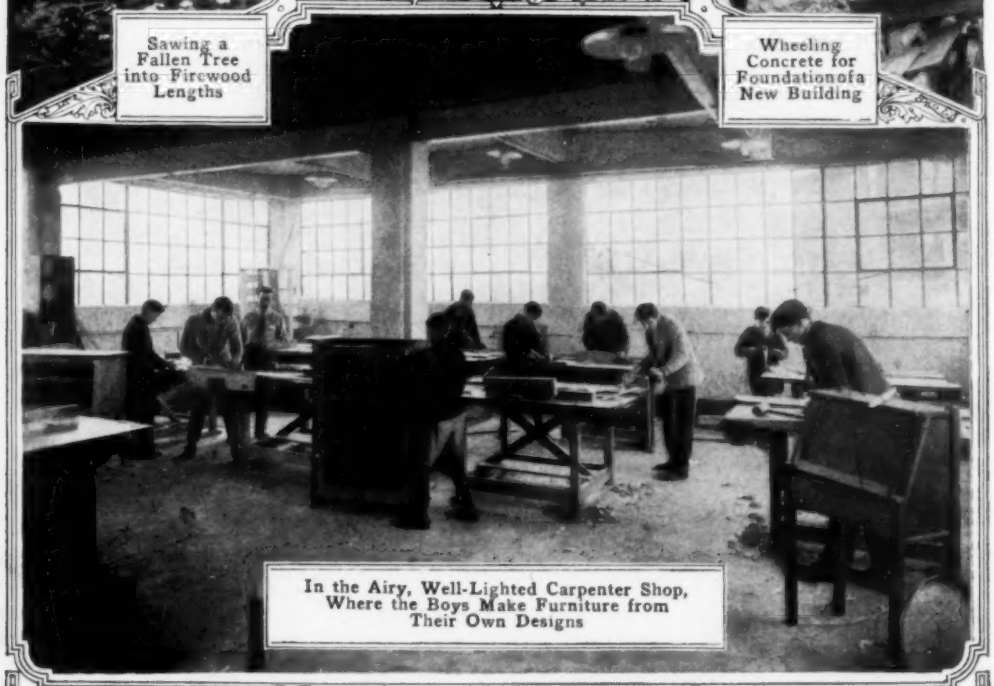
Setting a Window Frame in a Log Building

Even Young Boys Become Expert with Tools

Sawing a Fallen Tree into Firewood Lengths



Wheeling Concrete for Foundation of a New Building



In the Airy, Well-Lighted Carpenter Shop, Where the Boys Make Furniture from Their Own Designs

Many of the Boys Have Their Personal Gardens

cabins as well as of the dormitory where the smaller boys live, the schoolrooms, offices, shops, and laboratories is entirely in the hands of the pupils. Except for a fireman or two in the power house and the Chinese cooks in the kitchen, there are no paid servants at the school. Even waiting on the tables in the dining room is done by the boys, each of whom has to take his turn at serving the others. Thus, since all must share all tasks alike and no one is paid to perform any of them, no service is looked upon as menial.

Winter and summer the boys, both in work and play, spend more time out of doors than under roof. There is the farm work of

Boys Shelling Corn for the Poultry Yard

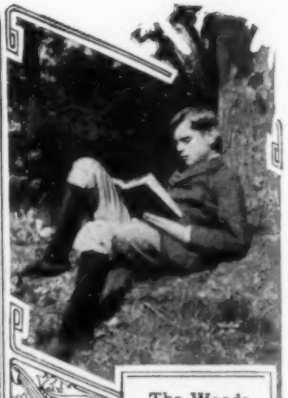
The Farm is Equipped with Modern Machinery

A Squad of the Younger Boys Cleaning Up the Grounds

All the Farm Operations are Performed and Directed by the Boys Themselves

Locking Up a Form in the School Printing Shop

a 200-acre farm to be attended to, for one thing, besides the policing and care of the grounds and walks, road building, and the construction of new school buildings of logs and concrete — beginning with the felling of the trees in the 500-acre woodland across the lake. Vegetable and flower gardens are to be tended, poultry and other live stock cared for, while such winter occupations as harvesting the ice crop from the lake partake more of the nature of sport than of labor. In all their labors the boys work in squads, each group under the direction of one boy who is held responsible for results and discipline. In this way qualities of leader-



The Woods Make a Pleasant Study Room

Concrete Mixing as the Boys at the School Do It

Setting the Forms for a Concrete Foundation

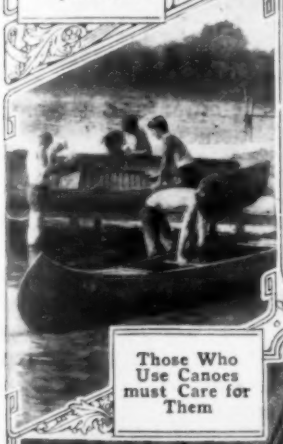
Cutting Ice on the Lake Is as Much Play as It Is Work for These Energetic Youngsters

ship are developed, which is one of the principal aims of the school, since most of the pupils are the sons of business men, and many of them will be called upon later in life to assume the management and direction of large affairs.

Besides the larger activities of the farm, there are shops for working in metals and in wood, the products of which are utilized in the school or sold outside. All the furniture for the buildings is designed and made by the boy carpenters; much of the art metal work is sold by one of the Chicago stores at good prices. In the printing shop not only the necessary printing for the school is done, but the local weekly paper of

Carrying Away Litter from Building Operations

Many of the Boys Keep Their Dogs at School



Those Who Use Canoes must Care for Them

A Squad Building a High Pier for Diving

A Dramatic Presentation of "Trial by Jury" Staged and Performed by the Boys

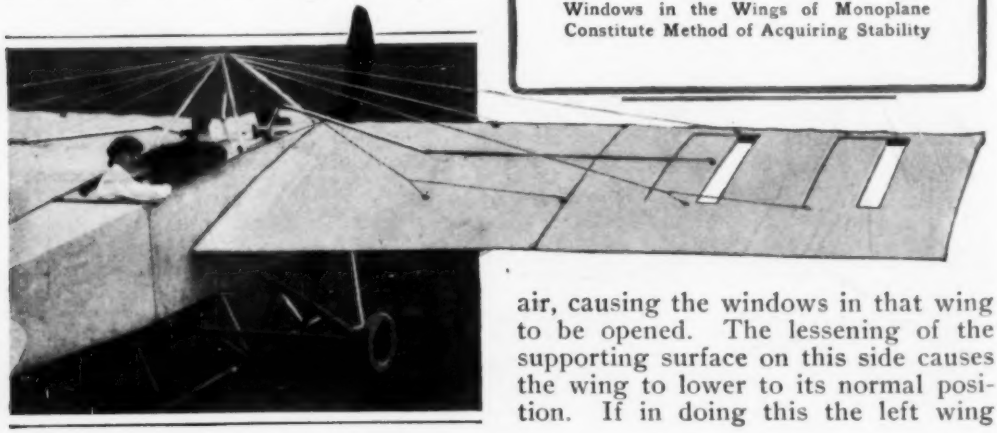
the village of Rolling Prairie is published—edited, too, in large part, by the older boys. Each pupil gets at least a taste of all the handicrafts, and those who show special aptitude along a particular line are encouraged and stimulated to develop their talents, especially in designing and planning things to be made.

Academic instruction goes hand in hand with the practical work of farm, gardens, and shops. Many of the boys have individual gardens, and the laying out of these, calculating the amount of seed required for the different vegetables and flowers, and the working out of other details, provide applications for instruction in surveying, drawing, and mathematics. The purely classroom courses are similar to those of other preparatory schools, but the shop and farm work, the close contact at all times with nature's processes and products, and the free outdoor life give these boys in addition a valuable store of experience and energy.

"Perception and self-expression are physical phenomena, performed through the medium of the muscles," is the way the head of the school expresses its basic idea. "The impressions stored in the brain by muscular reactions are the only accurate ones. We know woods, metals, rocks—all the raw materials of nature—only through handling them, cutting, hammering, plowing, impressing our muscles upon them, and registering their qualities and characteristics in our brains by means of our muscles. So the boy who has had the widest variety of these muscular experiences has the broadest actual knowledge of the fundamental elements on which all industry and business rest."

MONOPLANE WING ADJUSTER INTENDED AS STABILIZER

An automatic lateral stabilizer for monoplanes, designed to counteract the effects of dangerous air currents and right a machine when its wings are tilted sidewise, is a recent invention for safety in aerial navigation. The device consists of an apparatus which, in performing its function, opens and closes two windows placed in the tip of each wing, the action amounting to a lessening of the plane area on the rising side of the craft. An upturned crescent-shaped bar is fastened in the cockpit, and working on this is a sliding weight attached to which are two chains actuating valves in a compressed-air apparatus which move the levers controlling the windows. In this manner, when, for instance, the right wing is lifted, the weight slips to the opposite side on the bar and immediately turns on the air, causing the windows in that wing to be opened. The lessening of the supporting surface on this side causes the wing to lower to its normal position. If in doing this the left wing



Windows in the Wings of Monoplane Constitute Method of Acquiring Stability

is raised out of the plane occupied by the right, a counteraction occurs. It is contended by its inventor that this same action would bring the craft safely to the earth in case the engine should "die," leaving the machine in the air without motive power.

DAIRYMEN SUFFER HEAVY LOSS IN MILK BOTTLES

Thousands of dollars are lost annually by dairymen through the non-return of milk bottles left with patrons, according to statistics compiled by the Department of Agriculture. In one city alone, in the space of three years, 1,500,000 bottles were rescued from municipal dumps by a milk-bottle clearing house. The average bottle, it is claimed, makes 22½ trips before it is lost, which, at a price of 3½ cents per bottle, would mean a yearly loss of $5,575 to the dairyman delivering milk to 10,000 customers a day. It is contended that in reality only a few of the bottles are broken, the greater number of them being thrown into ash barrels by persons ignorant of their value.

WHEN SHOES ARE POLISHED SHIELD SAVES HOSE

For the protection of hose when low-cut shoes are being polished, a celluloid shield, which fits tightly about the ankle and covers the stocking, is being used at certain stands. The top of the piece is bound by a spring guard which holds it firmly in place while the work is being done, the bottom part fitting snugly between the foot and the shoe. The device is especially serviceable when delicate-colored hosiery is worn.

CHAIR PROVIDES SHINGLER SAFE ROOF SEAT

Eliminating the necessity of nailing cleats on a slanting roof for footholds, a chair for the use of shinglers, and

Chair Which Gives Level Seat for Roof Workers

others who work on roofs, has been invented which gives a man a level seat at whatever angle he is working. The device consists of a saddlelike board with a firm beak grip which holds securely to a shingle. A metal leaf protrudes under the edge of one of the thin boards, while the grip clamps down upon it. At the rear of the chair are two metal legs which are sharp-pointed and gouge into the wood. When weight is placed upon the chair it is held securely.

¶The largest wireless transmitting station in the world is the Cefndu station, near Carnarvon, Wales, which is to be used for direct communication with New York. The elevation is about 1,400 ft. above sea level, and there are 10 steel masts, each 400 ft. high.

CANNING ALBACORE NEW CALIFORNIA INDUSTRY

San Pedro Fishing Launch with a Catch of Albacore

The First Thing in the Canning Process is to Hang Fish Up to Drain and Dry

In the Canning Room: Here the White Meat, after being Cut to the Proper Size, is Packed in Cans

The albacore and the tuna—fish that until recently have been found in sufficient quantities to form the basis of an industry only on the Mediterranean coast—are now being caught in enormous quantities along the coast of southern California. These fish, which have the distinction of being warm-blooded, are much alike except for size, the tuna growing to approximately three times the size of the albacore, and often reaching a weight of 150 lb. Both are classed with the mackerel family. About the first of June they appear in large numbers along the coast from Santa Barbara south, running in schools that are easily caught when found. At San Pedro there is a large fleet of boats, all gasoline launches, that are used exclusively for catching the fish for the packers.

Every morning during the season this fleet is out before daylight and headed for the open sea. Here the boats scatter, going north and south in quest of a "school." When a school is found the fishermen throw overboard handfuls of sardines, the favorite food of the albacore and tuna, and in a few minutes the fish become so excited that they will leap from the water within a few feet of the boat to catch the little fish as they touch the water. This is the time for the fishermen to begin work. The fish are caught by hook and line, the hook being baited with sardines. Sometimes a boat will return fairly awash with its cargo, but the usual catch is from 600 to 700 pounds.

The fish are cleaned as they are caught and are allowed to drain, a method that assures a perfectly white meat. After being taken to the packer they are first hung up for several hours and are then prepared for the steam cookers, which consist of large steam-tight chests each holding about one

tion. After the cooking is completed the fish are taken from the chests, the skin and bones are removed, and the white meat is cut into strips of the proper size and packed in cans with pure salad oil.

The tuna, or tunny, as it is more generally known, is the same fish that was regarded as such a delicacy by the ancient Romans. By them it was called the Salsamentum sardicum. The last part of the name had reference to Sardinia, as on the coast of this island most of the fish of this species were caught at that time. At present the north coast of Sicily is the center of the industry in the Mediterranean. A peculiarity of the fish is that it approaches the shore periodically, wandering in large schools within well defined areas.

CEMENT CASKS KEEP WATER COOL WITHOUT ICE

In semiarid regions natives supply themselves with cool water through the use of porous earthen urns which are placed where they are shielded from the sun's rays and at the same time exposed to the action of the breezes. The moisture penetrating through the jars and accumulating on the exterior is evaporated rapidly by the hot winds, and the water within cooled. An adaptation of the same principle is a concrete water tank which may be used conveniently in places where ice is difficult to procure. Because ordinary concrete is porous it serves in this capacity just the same as if it were earthenware. Such a container is particularly suited for use on long golf courses and in harvest fields.

NEW SPRING WHEEL FOR AUTOMOBILES

One of the latest of resilient automobile wheels has curved spring spokes with fellies made in sections and arranged to move in and out radially to adjust the tire to irregularities in the road, and it is claimed that by using a solid tire with this wheel the same effect is produced as with a pneumatic tire on a rigid wheel. Two spring spokes are provided for each section of the felly and each spoke has roughly the form of an "S." The special feature about this wheel is the arrangement by which the sections of the felly are prevented from moving laterally while free to move toward or away from the hub. The ends of the sections are provided with metal brackets. One bracket has a tenon which fits into a slot in the bracket of the adjacent section. The slot is just the width of the tenon laterally, but is elongated sufficiently to permit the amount of play required for obtaining a resilient effect. Adjacent sections are held together by a nut placed on the threaded end of the tenon.

Automobile Wheel with Spring Spokes and Sectional Fellies That Move In and Out to Adjust the Tire to Irregularities in the Road

¶A bronze memorial tablet has been erected at Monhegan, Maine, to the memory of Captain John Smith.

CALIFORNIA ORANGE GROVE MOVED FIVE MILES

An Entire Orchard was Moved This Way in a Few Days

The Earth about the Roots of the Trees was Barely Loosened by the Operation

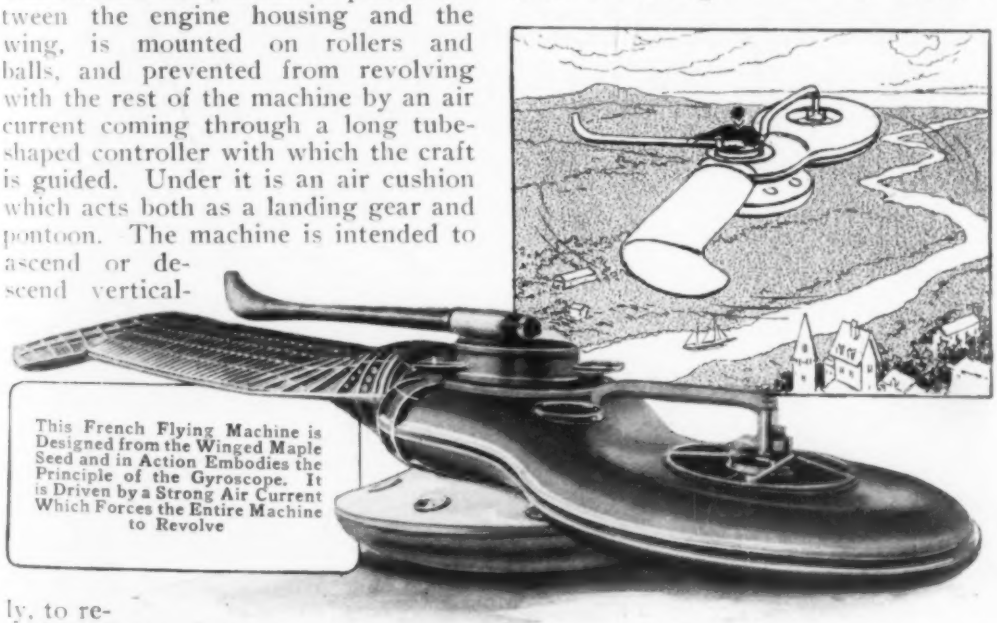
A 15-year-old orange grove in southern California was recently moved a distance of five miles and transplanted at the winter home of a New Yorker on Eucalyptus Hill outside Santa Barbara. The work was carried out with such care that the trees suffered no injury and after a few days appeared to be thriving almost as well as if they had not been touched. The moving was superintended by horticulturists who saw to it that the earth about the roots of the trees was disturbed just as little as possible. In raising a tree from the ground a pit was dug at one side of it and steel-headed planks forced under it with jack screws. It was then boxed and lifted, and trucks were placed under it, these being pulled up an inclined trench leading from the hole to the surface of the ground. The entire work, which also included the moving and transplanting of a number of palm trees, some of which stood 50 ft. in height, was accomplished in a few days.

RING LOST IN CIVIL WAR FOUND ABOARD SHIP

Recently when preparations were being made to overhaul the old sailing ship "Constellation," of historic fame, so that it might take part in the "Star-Spangled Banner" centennial, the Secretary of the Navy was advised that during the Civil War one of the crew had lost on the vessel a ring which had been given to him by his mother. It was stated that the loss had been deeply felt by the man, who had contended always that the ring would never be recovered until the ship should be overhauled in a navy yard. It was requested that during the work a lookout should be kept for the ring. Curiously enough, it was found under the iron covering plates of the anchor bitts, and was returned to the heir of the man who had lost it over 50 years before.

AERIAL CRAFT IS SHAPED LIKE MAPLE SEED

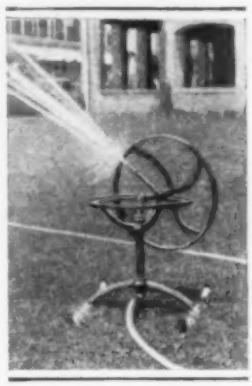
An extremely curious flying machine which attracted much attention was among the craft entered in the recent competition for the French prize offered in the interest of safety in aerial navigation. The air car is shaped like a winged maple seed, which, in fact, is the object that suggested its form, and in operation embodies the principles of the gyroscope. The propelling force is supplied by a single hollow-blade wing which is given its motion by the rapid passage of a current of air through it and out of an oval orifice at its extreme rear end. At the fore end of this is a housing containing the engine, which rotates in a plane parallel with that of the wing. Vanes attached to the motor produce the air current which is forced through its channel at a velocity of about 650 ft. a second, giving the wing a forward rotary motion. The circular hull, which is placed between the engine housing and the wing, is mounted on rollers and balls, and prevented from revolving with the rest of the machine by an air current coming through a long tube-shaped controller with which the craft is guided. Under it is an air cushion which acts both as a landing gear and pontoon. The machine is intended to ascend or descend vertically, to remain in one position in the air or advance at will, and to revolve like a winged maple seed and sail to the earth when the engine is stopped.



This French Flying Machine is Designed from the Winged Maple Seed and in Action Embodies the Principle of the Gyroscope. It is Driven by a Strong Air Current Which Forces the Entire Machine to Revolve

RAINFALL IS IMITATED BY LAWN SPRAYER

Distributing water evenly over a large area of turf in imitation of falling rain, and avoiding the swamping of any one place, a lawn spray has been built which operates on the principle of the turbine, breaking the water into drops or fine mist as desired. The nozzle of the sprayer is set in line with paddles which extend laterally from the circumference of a wheel. When the force of the water is directed against these the wheel revolves rapidly and travels around a circular base, the blades chopping the stream and hurling the water over the grass in a broad circle.



This scatters the mist evenly so that it is absorbed as it falls and does not beat down upon the sod or run off into low places.

ADJUSTABLE DINING TABLE FOR MOTOR CARS

For the convenience of the motorist in serving a picnic lunch in his motor

Eating Lunch at a Table in a Motor Car

car, an adjustable table has been made which fits securely across the body of the car in front of the rear seat, providing a clean, comfortable place at which to eat. In a seven-passenger car, by reversing the folding seats, it is possible for five persons to seat themselves around the board. The attachment is especially of service to the tourist when encountering bad weather.

APPEAL TO COLLEGE PRIDE PRESERVES CAMPUS

At one of the large universities the conventional command "Keep Off the Grass" has been abandoned by the institution authorities in their attempt to protect the lawns of the campus against needless injury. In spots where young, tender grass would soon be trampled out were it walked over frequently, appears a small sign bearing the single word "Please." At other places between the various buildings where it would be an easy matter for a path to be worn quickly were the students disregardful, is another reminder, "Make for a Pathless Campus." The enlistment of university pride has been found a much more carefully heeded appeal than the usual blunt demand.

A Sign with One Word Which Reminds

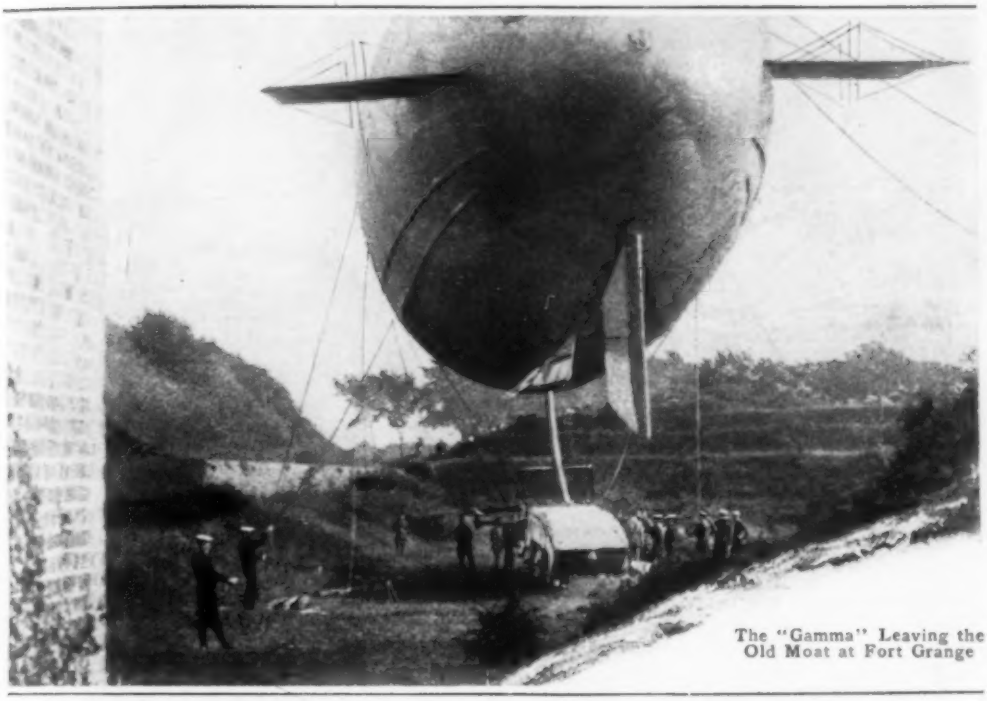
A Notice Which Arouses University Pride

WAR DEPARTMENT TO BUY AEROPLANES

In order to obtain military reconnaissance aeroplanes of the best type the War Department has invited manufacturers to take part in a competitive trial to be held at San Diego, Cal., beginning Oct. 20, 1914. Under the conditions announced for the test, any machine selected must be a two-seater biplane with dual control and a maximum speed of not less than 70 miles an hour, and must be able to make a nonstop flight of four hours in the air, and a climb of 4,000 ft. in 10 minutes, when fully loaded. If five machines meet the requirements, the Signal Corps will buy the three making the greatest number of points, at $12,000, $10,000, and $8,000, respectively. If only three or four machines qualify, the two making the greatest number of points will be bought at $12,000 and $10,000, while if only two qualify, the one making the better record will be bought at $12,000.

AIRSHIPS EMPLOY OLD MOAT FOR BERTHING PLACE

The now dry bottom of what formerly was a moat on the seaward side of Fort Grange at Portsmouth, England, has become an anchoring place for large military dirigibles used by the aerial corps of the army. In this spot, sheltered from the winds, the big en-

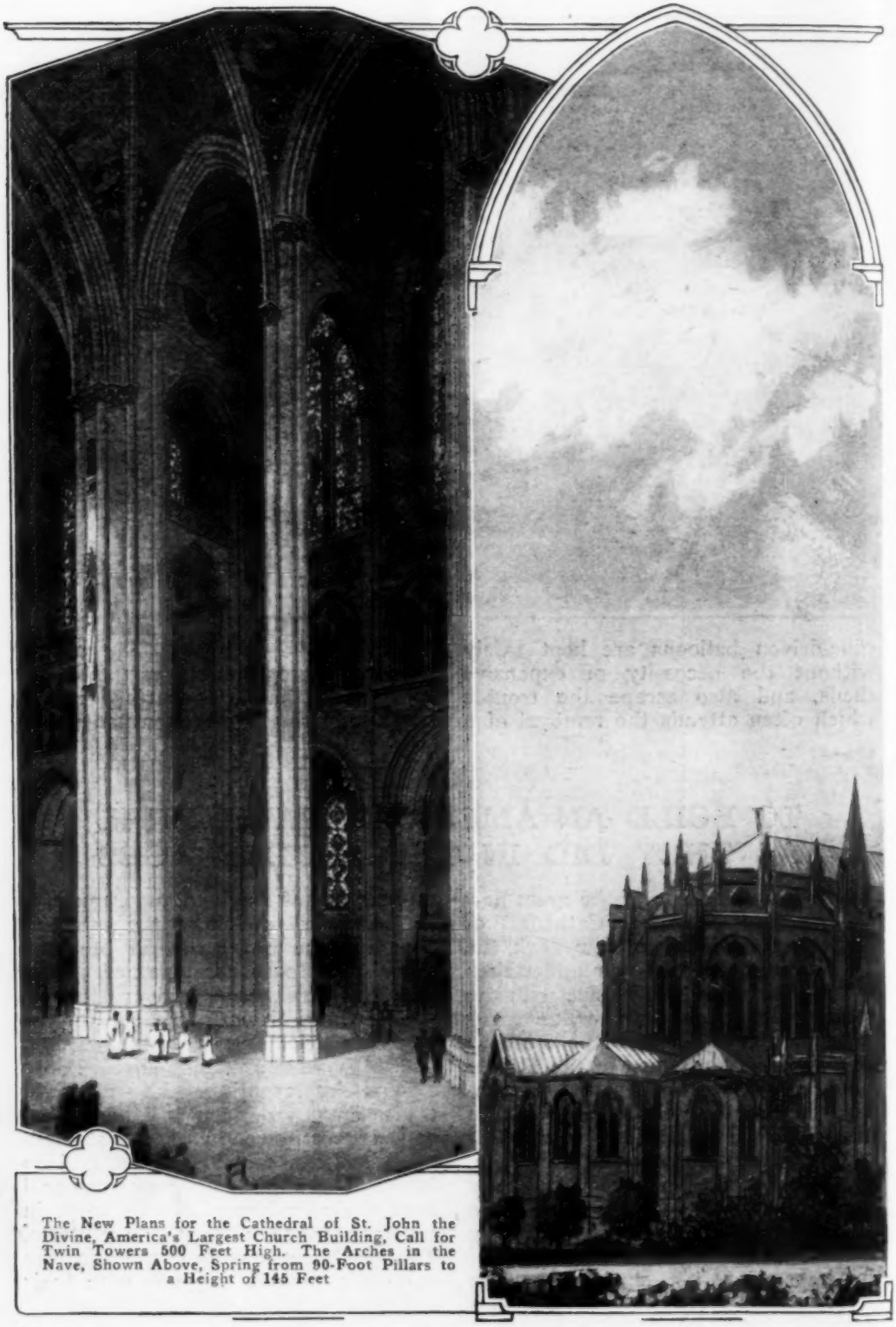


The "Gamma" Leaving the Old Moat at Fort Grange

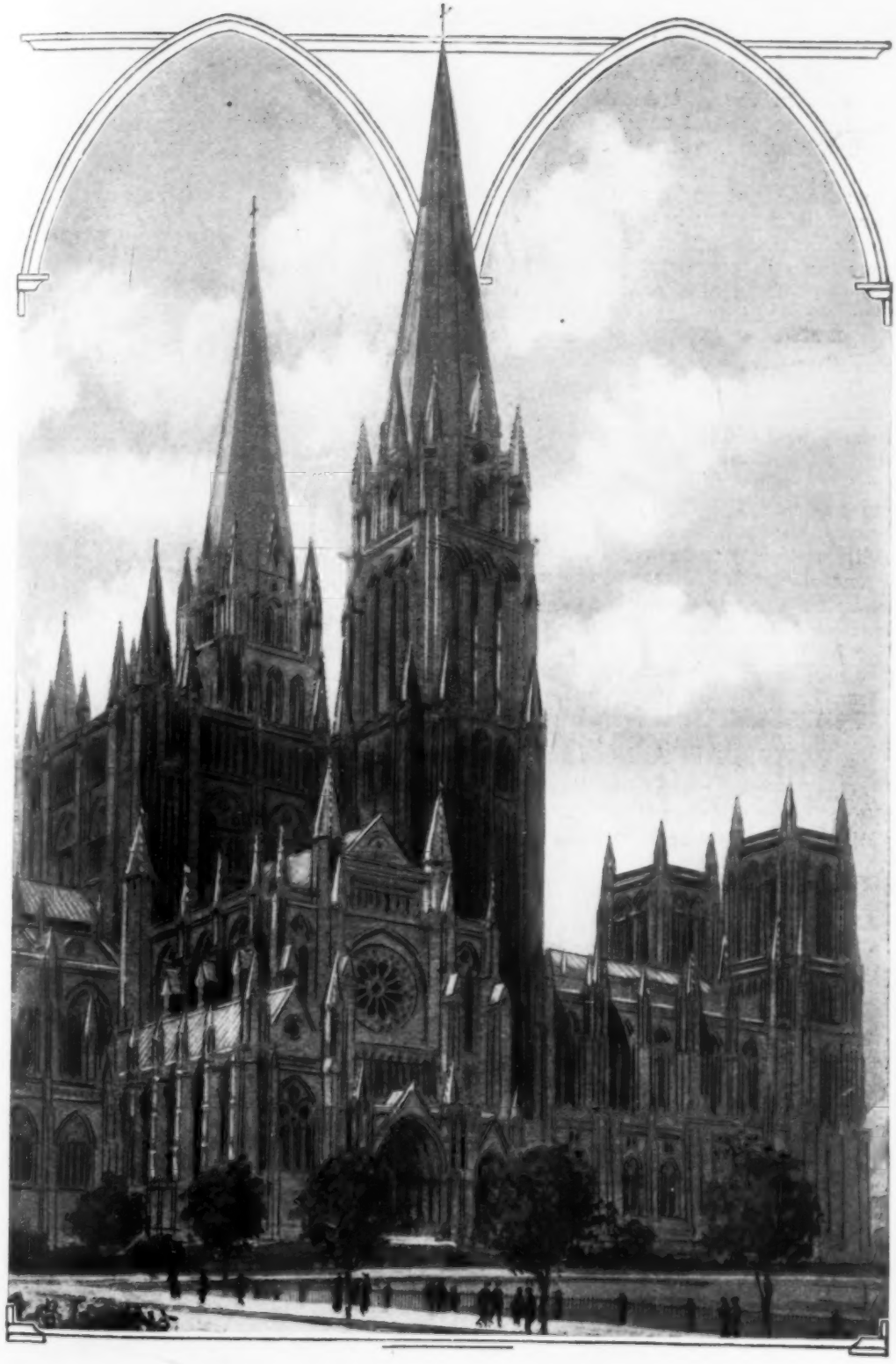
gine-driven balloons are kept safely without the necessity of expensive sheds, and also escape the trouble which often attends the removal of a craft into the open air. The accompanying photograph shows the "Gamma," which has been berthed in the moat, preparing to leave for maneuvers.

TO BUILD AN AMERICAN CATHEDRAL AS THEY DID IN THE MIDDLE AGES

IN the construction of the great new Protestant-Episcopal Cathedral of St. John the Divine, in New York, the largest church edifice ever undertaken in America and vying in size with the greatest European churches, an effort is being made to revive the methods by which the craftsmen of the Middle Ages labored in coöperation to produce the masterpieces of architecture which still rank among the most beautiful structures ever built by man. The architects, who have built many churches and cathedrals, have come to the conclusion that the only way to hope to get into the work some of the impressive, yet elusive, qualities that permeate the ancient religious monuments of England and France, is to endeavor to follow the methods that led the old cathedral builders. They hope to gather together, at the new cathedral, tried and trusted artisans who will work as much for the love of their calling as for their wages. These workmen will be divided into groups representing the principal trades employed, such as stonecutters and carvers, woodworkers, stained-glass makers, metal workers, and so forth. These groups of craftsmen will have their leaders who will work in constant touch with the architects. The architects will encourage the various craftsmen to work with their brains and imaginations as well as



The New Plans for the Cathedral of St. John the Divine, America's Largest Church Building, Call for Twin Towers 500 Feet High. The Arches in the Nave, Shown Above, Spring from 90-Foot Pillars to a Height of 145 Feet



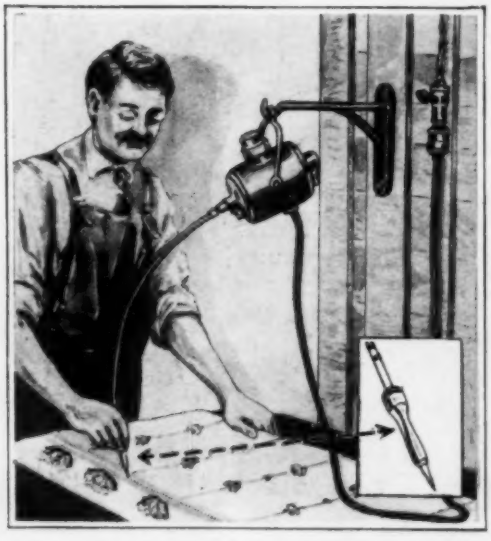
with their hands. They will not be tied down to rigid drawings. There will be no general contractor, but the general contractor's net profit, which on work of this sort usually amounts to about eight per cent of the cost of the building, will be distributed regularly in the form of bonuses to each workman in proportion to his regular wages. This, in short, is part of the famous guild system of building as it existed in the thirteenth and fourteenth centuries.

The new plans for the cathedral, a small part of which has been completed, call for twin central towers rising to a height of 500 ft. above the surface of the hill on which the structure rests. These will be visible from every part of New York, since the hill itself is nearly 200 ft. above the general level. Work is now under way on the nave, which will be built in five double bays, of which one will be built annually. The total cost of this part of the cathedral alone will be $1,000,000. The lofty arches of the interior will spring from pillars 90 ft. high, reaching a height of 145 ft. at their crowns.

A special feature will be made of the glass of the great windows of the cathedral. They will be extremely rich in color, reproducing with great fidelity the famous cathedral windows of the Middle Ages. In order to reproduce such effects, the glass will be made after the ancient formulas followed in glass making centuries ago. The kilns for making the glass will be set up adjoining the cathedral and the work carried on under the personal direction of the architect. The making of such glass is commonly called one of the lost arts, but, as a matter of fact, the ancient formulas have been preserved, and it is promised that the windows of St. John's shall rival in richness those of the Sainte Chapelle in Paris and medieval cathedrals.

PERFORATOR FOR CUTTING WALL-PAPER BORDERS

Cutting along the complicated outlines of wall-paper borders and appliques is slow and tedious work if done by hand. A device that punches a series of closely spaced perforations along the line so that the two sections can be easily torn apart has made its appearance. It consists of a small electric motor with a perforating tool carried at the end of a flexible shaft. The motor is loosely hung on a hook at such a height above the work table that with a 24-in. flexible shaft all parts of the work can be reached by the tool. The motor works at a high rate of speed so that in the hands of a skillful operator the tool makes a practically continuous cut.



How the Perforator is Used for Cutting Out Wall-Paper Borders and Ornamental Patterns

MACHINE FOR BUILDING WOVEN-WIRE FENCE

A fence-building machine that will not only stretch the straight wires but will weave in the mesh between them is one of the latest developments in farming accessories. This machine is equipped with a gasoline engine, which supplies the power both for traction and for operating, and will do its work going up or downhill as well as on the

This Machine Not Only Stretches the Horizontal Wires of the Fence, but Automatically Weaves the Mesh That Makes It a Woven-Wire Fence

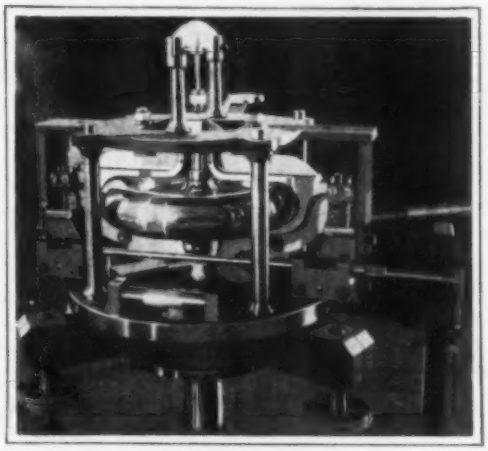
level. Stretching the horizontal wires is a simple process, but weaving the mesh requires a somewhat complicated mechanism of tubes, each revolving on one of the horizontal wires, combined with spools that feed the wire for the mesh. These operate automatically to twist the mesh wire around the individual horizontal wires and stretch it between adjacent wires. The machine requires little attention.

TIMBER-LAND RESERVATIONS ARE BEING INCREASED

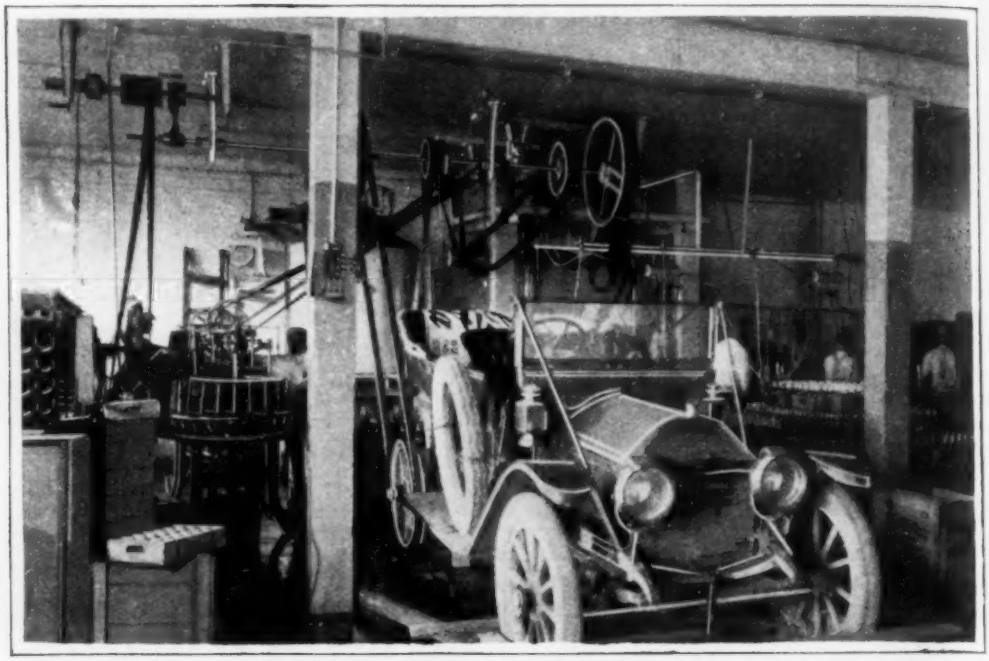
More than 6,000 additional acres of West Virginia timber land has been approved by the National Forest Reservation Commission for purchase by the government. These tracts bring the acreage of the Monongahela purchase area up to 42,887 acres, while the aggregate acreage now approved within the state amounts to 105,480 acres. Most of the first-mentioned lands have been cut over, but they originally bore hard woods, and it is thought that a stand of young trees can be developed within a few years. The lands approved since the establishment of the purchase policy in 1910 now total 1,104,000 acres, and represent $5,500,000 in initial price.

ELECTRIC GYROSCOPE IN PARIS LABORATORY

Part of the scientific equipment of the University of Paris is a gyroscope run by electric power, the motor being under the disk and on the same shaft with it. This gyroscope has been recently installed for experimental purposes. It is fitted with delicate instruments for making measurements of the forces generated, has a three-point adjustable support, and is of tremendous power on account of the massing of the metal in the rim of the disk.



Electric Gyroscope Installed for Experimental Purposes in a Laboratory of the University of Paris



Automobile Harnessed to the Machinery in a Bottling Works When an Entire Mississippi Town was Run by Motor Cars for Several Days

SHEET-METAL SNIP-HAMMER HAS INVOLUTE SPRING

A combination hammer and snip which has been produced recently is made with narrow blades to make it useful for a variety of light sheet-metal cutting. The tool is 8 in. in length, has a ¾-in. blade, and weighs 10 oz. An involute steel spring between the two levers causes the jaws of the instrument to open automatically after they have been gripped together in cutting, which eliminates the necessity of a separating pull with the hands. At the head of the tool there is a knob which extends over the edge and is intended to be used as a hammer.

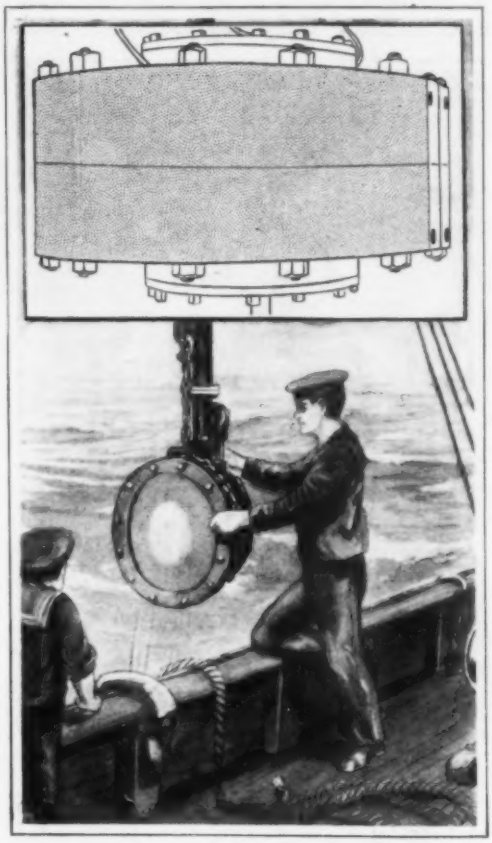
MOTOR CARS FURNISH POWER TO RUN ENTIRE CITY

When necessity requires it, an automobile may be set to the performance of functions far outside the field for which it was primarily intended. This was strikingly demonstrated at Meridian, Miss., when for several days the whole town was literally run by motor cars. A boiler explosion in the power plant which supplied the city with electric energy ended in the closing down of practically every manufacturing house in the place. Business was at a complete standstill with scant hope of being rejuvenated for some time, when the superintendent of a factory conceived the idea of harnessing his automobile and using its motive power for operating the company's machinery. The experiment proved successful and it was only a matter of a few hours until almost every automobile in the town had been turned to a like use. Newspaper presses which had remained stationary throughout the trouble, were turned

by motor cars. In practically every business institution where power was required, an automobile was hitched to the machinery and work started.

OSCILLATOR GIVES WARNING OF DANGERS AT SEA

Through the application of a marine signaling apparatus which during recent tests has demonstrated material possibilities, it is believed the dangers of great sea disasters will soon be manifestly diminished. An electric oscillator which announces the presence of another vessel, locates icebergs, indicates sea depths, and provides for the transmission of submarine telephone and telegraph messages is an invention which is now being watched with great interest by navigators. The device consists principally of a 24-in. metal diaphragm attached to a cylindrical case, within which is an electromagnet actuating a copper sounder. The oscillators, when in permanent position, are placed inside of a ship's skin, beneath the water line, on both the port and starboard sides. Vibrations of the diaphragm amounting to a movement of one-thousandth part of an inch and repeated with great rapidity throw out sound waves under the water which may be caught by the receiving apparatus on another vessel. Signals of this kind have been heard at a distance of 30 miles, while at shorter ranges numerous telegraphic conversations have been carried on successfully. In one instance the experimenters actually talked between two ships. In locating icebergs, it is the echo which gives warning of the presence of danger. With a stop watch it is possible to estimate quite accurately the distance of these barriers, this being accomplished in one instance after the steam whistle on a revenue cutter had failed to obtain an echo when within 150 yd. of a berg. While the fog horn has been of certain assistance to the mariner it also has been an instrument which has terrified him. It has told him that he was near danger, but rarely whether he was headed for it or running from it, because the air currents made it impossible to determine absolutely whether the sound was coming from one direction or from another. The oscillator sending its vibrations through the water eliminates this. By listening from both sides of a ship it is easy to determine from what direction the strongest sound is coming, and it then is possible to turn immediately away from, for instance, the course of an approaching steamer. To illustrate the strength of the device, as already demonstrated, an oscillator hung over the side of a tugboat, in a test made at the Boston lightship, received signals from a collier rounding Cape Cod, the message being transmitted in code under the water across Massachusetts Bay.



Above: Diagram of the Oscillator Which Receives and Transmits Signals beneath the Water

Below: Lowering the Apparatus into the Water from a Tugboat during a Recent Test

FIRE AND WATER GUSH OUT OF ARTESIAN WELL

Gushing forth fire and water at the same time, a flaming fountain near Sacramento, Cal., represents a curi-

Light from This Queer Well Allows Men to Work at Night

osity which originally was intended to be merely a useful and not ornamental artesian well. A bore was drilled to a depth of about 800 ft. in an attempt to obtain water for irrigation purposes. After water was struck, a flow of natural gas shot from the earth with it. When this is ignited, the flame sprays out in a dome-shaped glow, giving sufficient light to enable a night shift of workmen to carry on their operations almost as easily as in the daytime. Examination is being made to ascertain whether the flow of gas is of sufficient volume to warrant its saving.

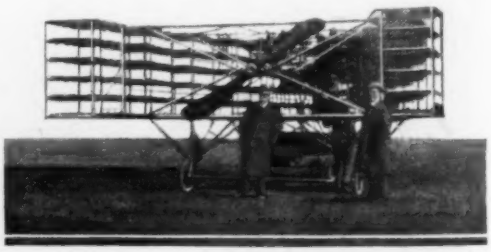
¶Tests at an eastern university show that properly filtered oil may be used indefinitely without losing its lubricating qualities.

NEW SEARCHLIGHT THROWS HUNDRED-MILE BEAM

The most powerful electric lamp in the world, visible under favorable conditions from a distance of more than 100 miles, has just been placed in service at the New York navy yard. If the tests satisfy the government it is expected that this lamp will replace the searchlights now in use in the navy and in coast-defense work. It is equipped with a 44-in. reflector, and recent measurements have indicated a delivery of 450,000,000 cp. at a distance of two miles, while the searchlight now in use in the navy, equipped with a 44-in. reflector, gives only 60,000,000 cp. It is estimated that this lamp with a 60-in. reflector will give 1,000,000,000 cp. at a distance of two miles. The carbons are only ⅝ in. in diameter and are made with a metallic core. They are kept cool and prevented from vaporizing under the intense heat by means of a jet of gas which is played against the ends of the carbons.

MULTIPLANE BUILT TO ACT AS PARACHUTE

Constructed entirely of metal and claimed to be capable of descending vertically with safety, an arrow-shaped multiplane of Italian invention is accredited with the performance of unusual feats during its recent trials. By means of an auxiliary motor the



Flying Machine, Built Entirely of Metal, Which may Descend Vertically

angle of incidence of all the planes may be changed during a flight to meet the various conditions encoun-

tered in the air. Since it is possible in this way for the wings to be folded back in a manner somewhat similar to those of a bird, the supporting area remaining constant while the air resistance is decreased, marked variation in speed is permitted. The craft is fitted with two Gnome engines which drive a single propeller by friction transmission. When the machine is made as a flying boat with a metal passenger hull, its weight amounts to 2,860 lb. The wing surface is approximately 725 sq. ft. In the event of engine trouble during flight, the plane arrangement is expected to act in the manner of a parachute, allowing the machine to drop gracefully to the earth.

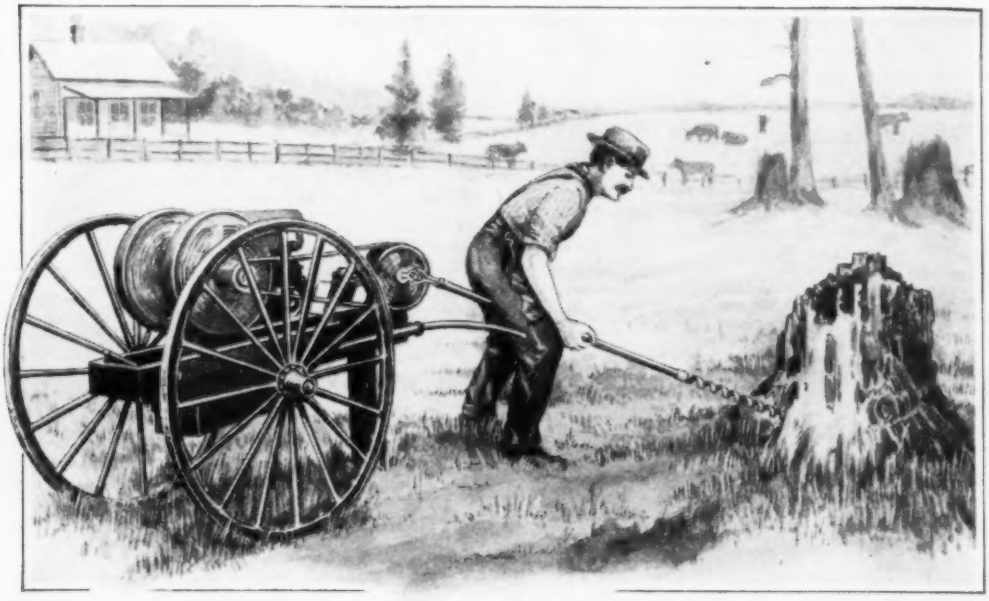
Unloading Shipload of Dutch Bees Sent to Replace Those Destroyed by Disease on the Isle of Wight

CARGO OF DUTCH BEES SENT TO ENGLAND

One of the strangest cargoes ever carried on the sea was a shipload of bees recently sent from Holland to the Isle of Wight, England, where the native bees are threatened with extinction by disease. Experiments have shown that the Dutch bees are hardier than the native bees of England and it is believed that this means the disease can be stamped out and the industry saved from serious injury. The cargo consisted of 300 hives containing about 10,000,000 bees.

GAS-ENGINE-DRIVEN AUGER FOR BORING STUMPS

The boring of holes in tree stumps for blasting or burning them out is usually a tedious and expensive undertaking. A boring machine which, it is claimed, does this work effectively and economically has recently been in-

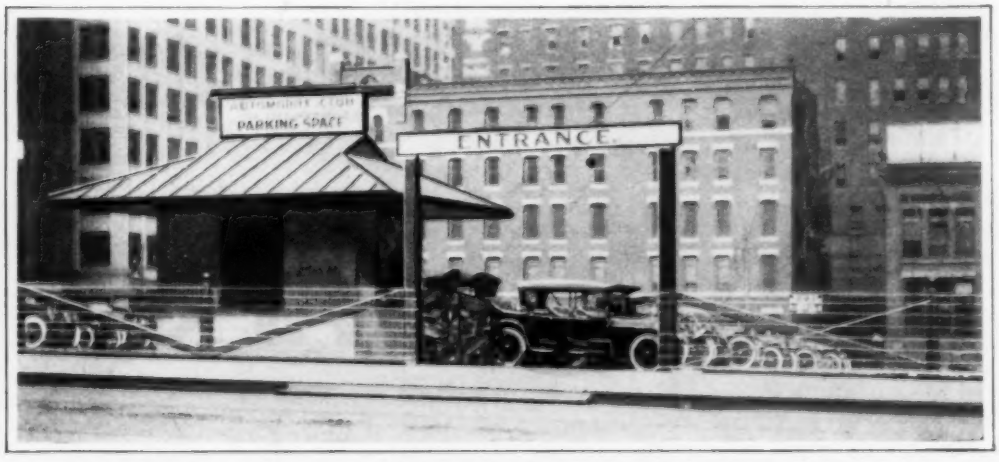


Portable Machine Which is Designed for the Quick Removal of Stumps

vented. It consists of a gasoline engine which actuates a long auger and operates at a cost of from four to eight cents for each stump. The machine is mounted on a cart truck, and is easily moved from point to point, while a universal-joint connection between the drill shaft and transmission member permits the auger to be set at any angle up to 45°. This part of the device may also be connected with any power generator which is at hand.

OPEN-AIR GARAGE VALUED AT FIVE MILLION

In order to provide a parking place for motor cars in the business section of Pittsburgh, the local automobile club acquired the use of a vacant piece of property in the heart of the downtown district, valued at $5,000,000. The lot was fenced in, a gasoline and supply station provided, and a shelter house built for the chauffeurs. Suf-



The Ground Occupied by This Open-Air Garage is Valued at More Than Twelve Times as Much as the Motor Cars Usually Parked within It

ficient space is provided for more than 200 machines and a small charge is made to cover expenses. Motorists are prohibited by law from leaving their cars standing more than 30 minutes on any of the business thoroughfares, and since the open-air garage is practically the only place available it is usually packed. The place undoubtedly represents as valuable a lot as is used anywhere in this country for motor-car storage purposes.

NEW AMERICAN ALTITUDE RECORD IS SET

In a recent flight at Kansas City, Mo., with a domestic-built aeroplane, De Lloyd Thompson, a Chicago airman, broke the American altitude record by reaching the height of 15,600 ft. The previous record was held by Lincoln Beachey, who climbed to the height of 11,642 at Chicago, in 1913, at that time surpassing a flight made three years before in California by Arch Hoxsey, who established an unofficial record of 11,474 ft. European fliers, however, have surpassed all Americans in altitude work, several of them having flown much higher, while the record is four and two-thirds miles.

ECONOMIC USE OF CURRENT SHOWN BY MOTOR METER

To indicate, besides the total mileage covered by an electric vehicle during the course of a day's work, the distance traveled by it in coasting with power cut off, a special meter for use in this type of car has been made. The device is actuated by a flexible shaft connected with a wheel, as in the case of other meters for speed and mileage indication. Its mechanism is controlled by electromagnets, and the moment the current feeding the motor is cut out the apparatus which tabulates the coasting distances automatically commences its operation, not interfering, however, with the working of the general meter, which is continuous. One of the advantages of such an instrument is that it keeps an accurate record of the manner a company's motor truck, for instance, has been driven, showing at a glance whether the current has been used economically or not.

Waste of Electric Current by Chauffeur Shown by Meter

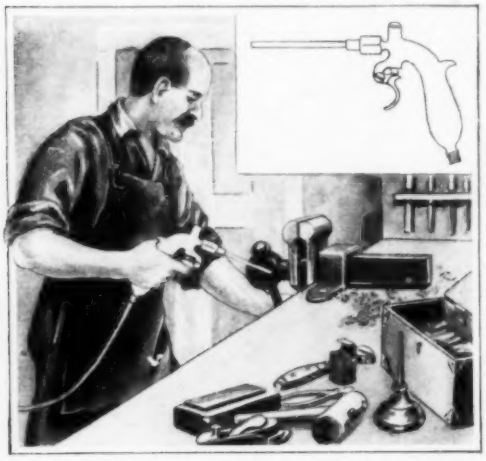
SAMPANS OF JAPAN ARE SEAWORTHY CRAFT

As is characteristic of many Japanese things, the sampans, or small boats, of that country are picturesque in their form. These craft, as compared with similar-sized boats of other countries, are unusually seaworthy and are able to withstand the strain of heavy seas. There are large numbers of these boats in use now at Hawaii, many of which lately have been equipped with small gasoline engines.

Peculiar Japanese Craft Withstand Heavy Sea

PNEUMATIC DEVICE REACHES PARTS HARD TO CLEAN

A pneumatic cleaning gun, for reaching the interior of complicated machinery is now manufactured. It consists



Handy Contrivance for the Machine Shop

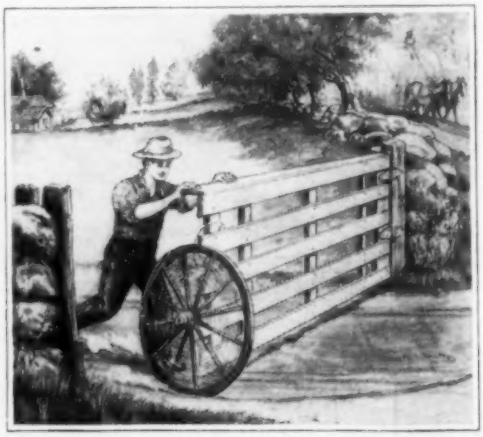
of a nozzle, in the shape of a pipe or barrel, the control valve being given a pistol grip. A small air hose is attached to the bottom or butt of the handle, and a touch of the trigger releases a powerful stream of compressed air, which cleans out dust, chips, and accretions quickly. A short length of flexible copper pipe is furnished with each gun, slipping over the nozzle, and can be bent by hand into such shape as to reach places not accessible to the straight pipe.

HUGE STORE OF DYNAMITE BLOWN UP AT PANAMA

The Mindi powder and dynamite magazine, located about two miles from Gatun dam, exploded on July 5, 1914, killing the watchman in charge at the time and destroying the concrete and steel building in which the explosives were stored. At the time of the explosion there were 435,525 lb. of dynamite and 15,394 lb. of powder stored in the magazine. The blast tore a hole in the earth where the magazine had stood and deposited the material from it, and from the side of the adjoining hill, in an enormous mound, from 12 to 15 ft. high, part of which extended across the Mindi River and completely dammed that stream. The body of the watchman was thrown to a distance of about 200 ft., and all animal life within a radius of several hundred yards was destroyed, as shown by the carcasses of deer, and other animals, found after the explosion. Windows were broken in Colon, Gatun, and Mount Hope, but owing to the isolated position of the magazine, no serious damage was done at any of these points.

GATE WITH WHEEL OPENED AS EASILY AS DOOR

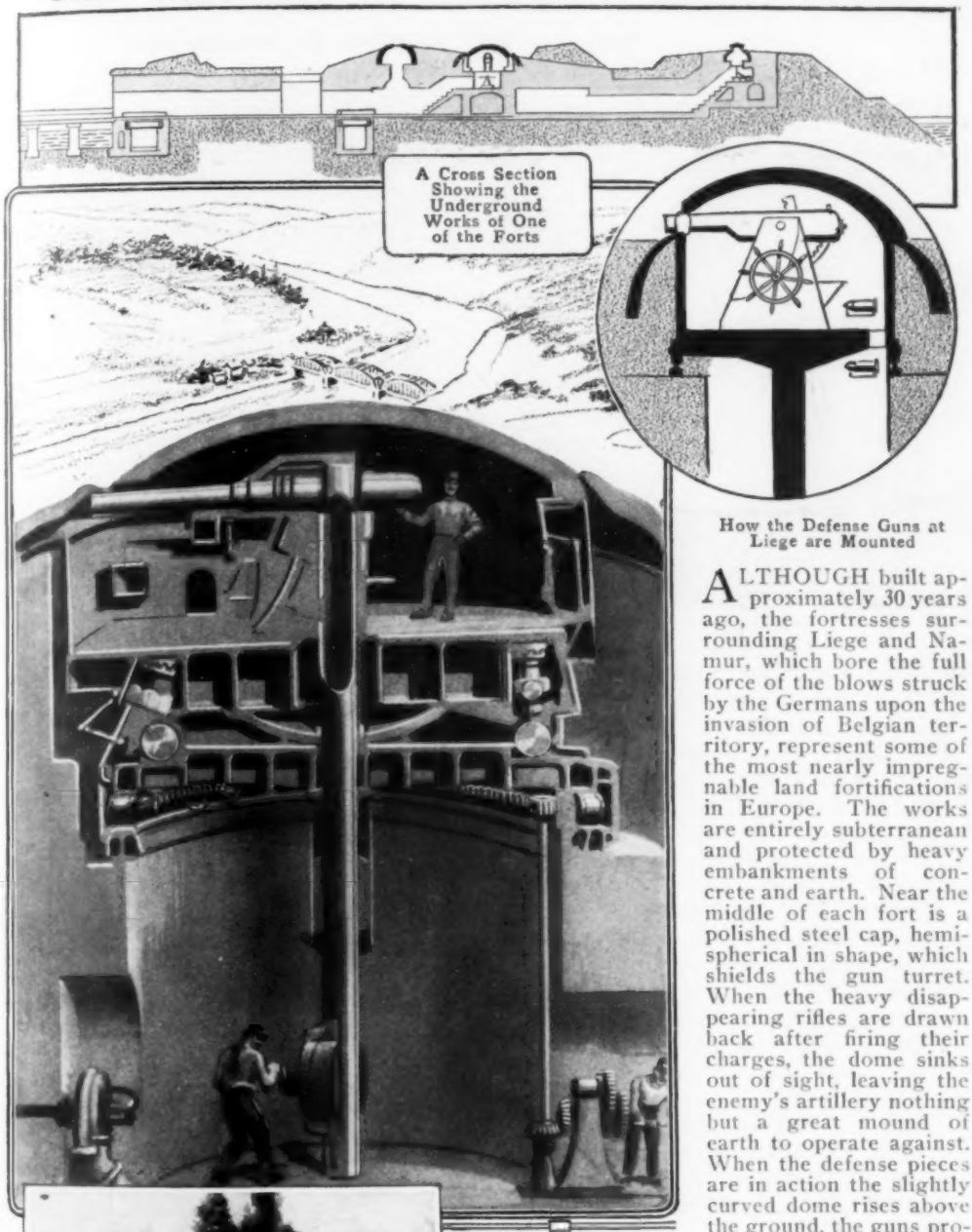
In order to make it less difficult to open a heavy gate at the entrance of his barnyard, a Maine farmer mounted the free end of the structure on a discarded wagon wheel. A shaft was attached to the barrier to accommodate the wheel which supported half of the weight of the gate. This makes it unnecessary to do any lifting when it is wished to move the section back, the gate swinging around as easily as an



Wheel Mounting for Gate Makes Its Operation Convenient

ordinary door. By a cord arrangement the man is able to close the gate, after driving through it, without leaving his vehicle.

THE REMARKABLE FORTIFICATIONS OF LIEGE



How the Defense Guns at Liege are Mounted

ALTHOUGH built approximately 30 years ago, the fortresses surrounding Liege and Namur, which bore the full force of the blows struck by the Germans upon the invasion of Belgian territory, represent some of the most nearly impregnable land fortifications in Europe. The works are entirely subterranean and protected by heavy embankments of concrete and earth. Near the middle of each fort is a polished steel cap, hemispherical in shape, which shields the gun turret. When the heavy disappearing rifles are drawn back after firing their charges, the dome sinks out of sight, leaving the enemy's artillery nothing but a great mound of earth to operate against. When the defense pieces are in action the slightly curved dome rises above the ground, the guns protruding through one side like great eyes. From a distance it looks not unlike a huge turtle's back, which ricochets the projectiles striking it. The observation towers are similarly arranged with protecting domes. The mechanism makes it possible to operate the guns in all directions.

Above: On the Inside of One of the Gun Turrets, Ammunition for the 6 and 9.7-Inch Guns is Hoisted through the Center Tube. The Turret is Mounted on Wheels so That It Revolves Easily

Left: How the Fortification Looks to an Attacking Army. These Turtle-Back Cupolas are All That Show above the Earth

WAR IN THE AIR, HERALDED FOR YEARS,

"Heard the heavens filled with shouting, and there rained a ghastly dew

THE great war in the air, long heralded by poets and prophets, has become a reality.

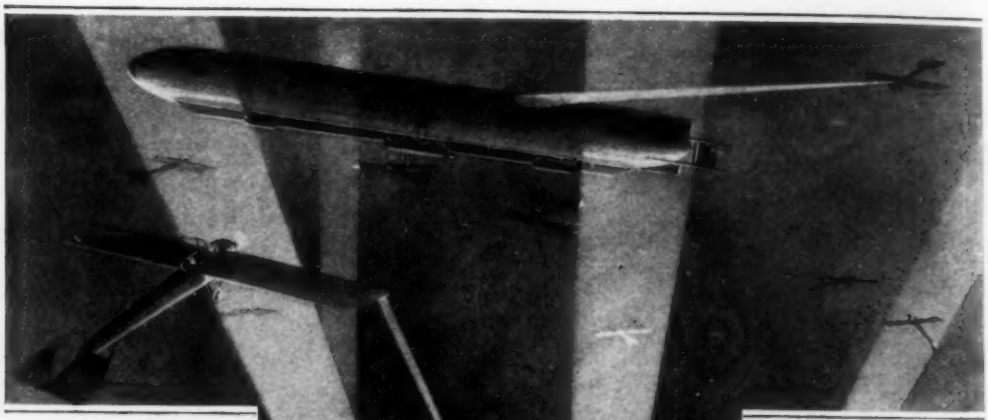
The one strikingly new phase of warfare which makes the present European conflict different from all the wars of all time past is the use of air craft. From the very opening of hostilities the aerial forces of the nations involved have taken part in practically all the operations, scouting, attacking fortresses and even battling against each other. The first spectacular climax came when a German Zeppelin stole past the fortifications of Antwerp in the night and for the first time in history a sleeping city was bombarded from the skies. Here, at last, was the realization of the visions of the seers who had foretold this added horror of war.

Hidden by darkness and with en-

HAS AT LAST BECOME AN ACTUALITY

From the nations' airy navies, grappling in the central blue."
—Tennyson in "Locksley Hall."

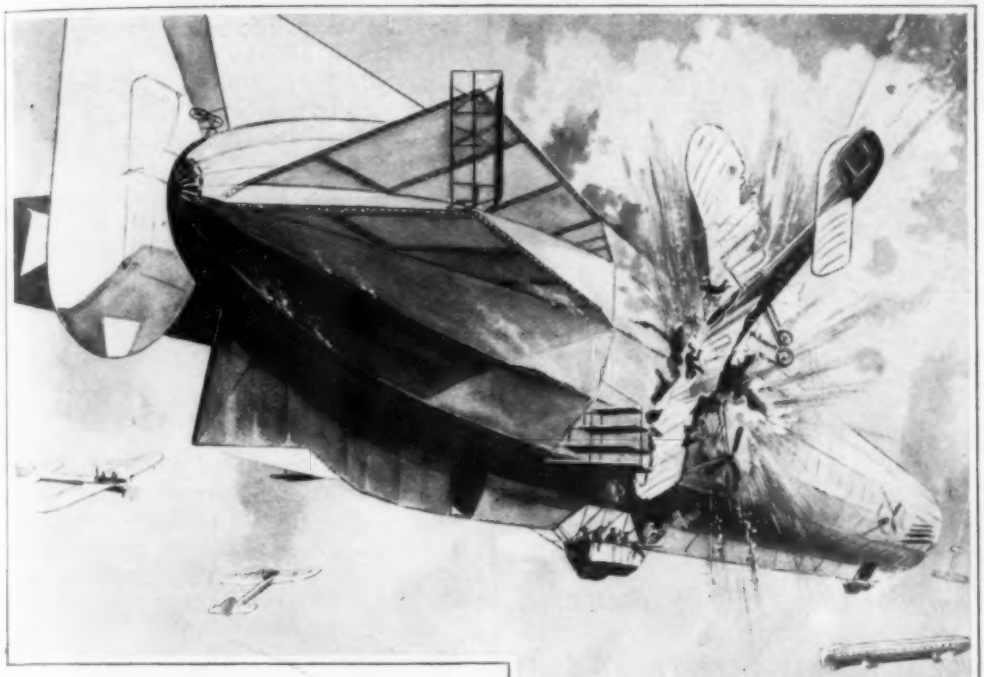
gines muffled, the Zeppelin dirigible which made the attack upon Antwerp stole over the city to a point above the palace which the Belgian royal family temporarily occupied. It hovered there, a thousand feet from the ground, an indistinct mass silhouetted against the sky. With a rocketlike fizz a bomb curved downward in a fiery streak. Buildings crumbled, carrying their sleeping occupants down to death or mutilation. The bombardment continued, projectiles exploding within the grounds of the palace and raining upon other public buildings, even striking a hospital. Street after street was filled with debris. Sixty houses were practically destroyed and 900 more were damaged. Machine guns fired shots into the inky darkness without effect. In all, 10 bombs were hurled, after which the craft lifted high and



disappeared in the night. A United States coast-defense artillery officer, who was present in the city, asserted that the projectiles used were loaded with shrapnel, fired from guns and burst by some new, high explosive. Some of the Zeppelins are known to be equipped with 2-in. quick-fire guns which shoot shells of Belgian macarite, and some of the work may have been done by these. It is known also that the craft carry 220-lb. bombs, loaded with a special bursting charge which can destroy practically everything within a radius of 250 yards.

Even before the bombardment of Antwerp new aerial history was being made. At the very beginning of the war the cables brought the story of how Roland Garros, the French airman who was the first to fly across the Mediterranean, drove a monoplane at top speed into the side of a German Zeppelin, destroying the larger craft instantly and killing its crew of 25 men, although at the sacrifice of his own life. A similar battle is reported as having marked the attack upon the fortresses at Liege when the German forces pushed into Belgian territory. One of the large dirigibles succeeded in surviving the fire of the enemy and dropped bombs over the city. On the following day, when it attempted to repeat the work, it was met by a Belgian aer-

Searchlights on the Eiffel Tower and Other Buildings to Guard Paris against a Night Attack by Zeppelins

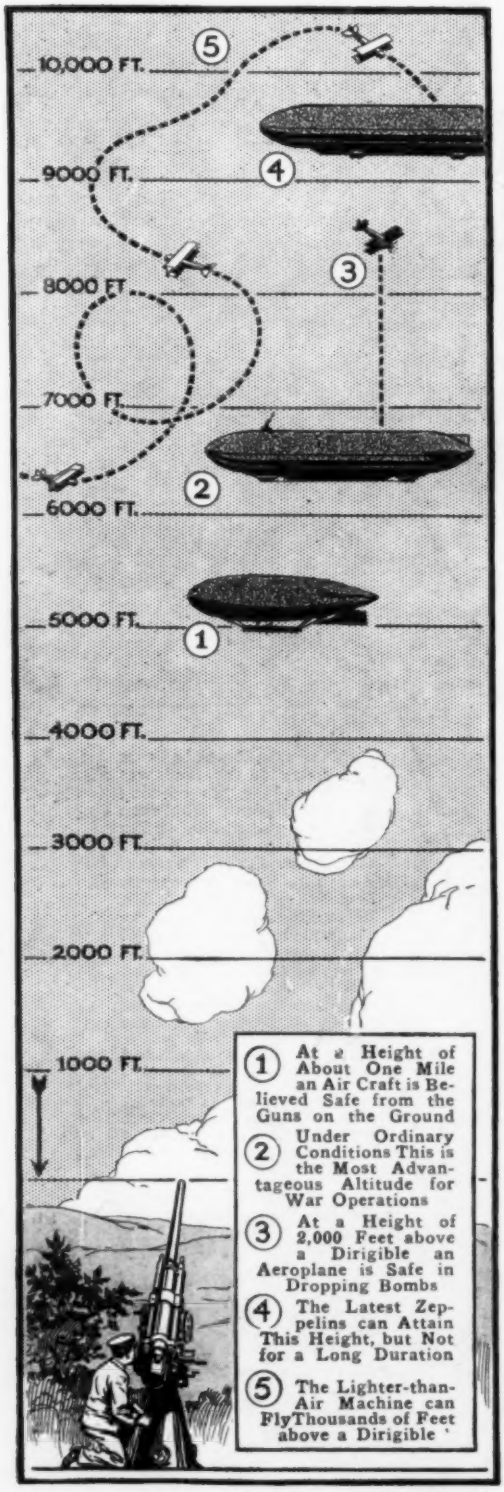


oplane which pursued and rammed it. A spectacular use of air craft was made at night at Louvain. Soon after darkness had set in, both sides ceased firing and the Belgians apparently believed that the fighting was over until dawn. About midnight five German flying machines swept low over the enemy's positions and dropped what are described as "plaques," which burst into flames immediately upon striking the earth, illuminating the Belgian ranks and directing the German fire.

Aeroplanes met aeroplanes above the battle field near Mons when the Germans bore down upon the allies. A German dirigible of the Parseval, or nonrigid, type was riddled with bullets while flying over Russian territory. A monoplane of the Kaiser's fleet was brought down in Belgium near Brussels by riflemen, while a German machine carrying a pilot and two officers was wrecked and its crew killed on the Austrian frontier by firing from the ground. A French airman, watching the movements of the Germans during one of the early skirmishes on the border, was wounded by a rifle shot. In

THE first battle ever fought in the clouds was waged at the opening of the European war between a Zeppelin dirigible and a French monoplane. Roland Garros, a French airman, according to cabled reports, demolished the battle airship by sacrificing his life in plunging through the hull of the larger vessel at high speed. The encounter took place a thousand feet above the earth. It was brief. As the Zeppelin burst under the terrific impact there was a flash of fire, an explosion, and then a hopelessly tangled mass of wreckage on the ground. All of the crew of 25 manning the German craft were killed. Both craft were doing scouting duty on the frontier.

LONG-HERALDED AERIAL WAR HAS ARRIVED


10,000 FT.
9000 FT.
8000 FT.
7000 FT.
6000 FT.
5000 FT.
4000 FT.
3000 FT.
2000 FT.
1000 FT.
1 At a Height of About One Mile an Air Craft is Believed Safe from the Guns on the Ground
2 Under Ordinary Conditions This is the Most Advantageous Altitude for War Operations
3 At a Height of 2,000 Feet above a Dirigible an Aeroplane is Safe in Dropping Bombs
4 The Latest Zeppelins can Attain This Height, but Not for a Long Duration
5 The Lighter-than-Air Machine can FlyThousands of Feet above a Dirigible

COURTESY OF ILLUSTRATED LONDON NEWS

a flight of 186 miles over German territory the aeroplane of Adolphe Pégoud, the French airman who was the first to fly upside down, was struck by 97 bullets and two shells.

In its first month this greatest of all wars has demonstrated that "the nations' airy navies" are a factor of warfare to be seriously reckoned with. It seems to have been proved, too, that no airship or aeroplane is safe against gun fire from the ground at a height of less than one mile. One of the important questions which the experiences of this war will also ultimately answer is that of the relative value of the two general types of air craft; whether the lighter-than-air dirigible to which the Germans have mainly pinned their faith, or the heavier-than-air aeroplane, faster and less expensive, which is the mainstay of the French, English, and Russian air navies, is superior in war. A rather significant fact in this connection is that in almost every instance in which a Zeppelin is known to have been used for offensive work the dispatches have later reported its destruction.

The actual aerial strength of the various nations is more or less a matter of supposition, because official figures of this nature are government secrets. In any case it would be possible for a power to have twice the number of air craft that it is accredited with in the current statistical reports. Purely from a numerical standpoint, however, it is supposed that France and Russia combined are stronger in the air than the fleets of Germany and Austria. France is thought to have had at the beginning of the war 780 aeroplanes; Russia, 705; Germany, 560; England, 225; Italy, 225, and Austria, 142. Of dirigibles, France was credited with 28, mostly of the flexible type and many of them old; Germany, 18, all in good condition, besides 10 Zeppelins in the course of construction; Russia, 17; England, 13; Italy, 10, and Austria, 5. With such an array of flying men-of-war putting to the test new methods of dealing death and destruction, there is no imaginable limit to the awful possibilities of modern warfare.

ACTUAL SCENES FROM THE EUROPEAN WAR ZONE

[On this and the following pages are shown the first photographs to reach America that were actually taken after the beginning of hostilities.]

French Troops Bivouacking in a Public Square on the March to the Front

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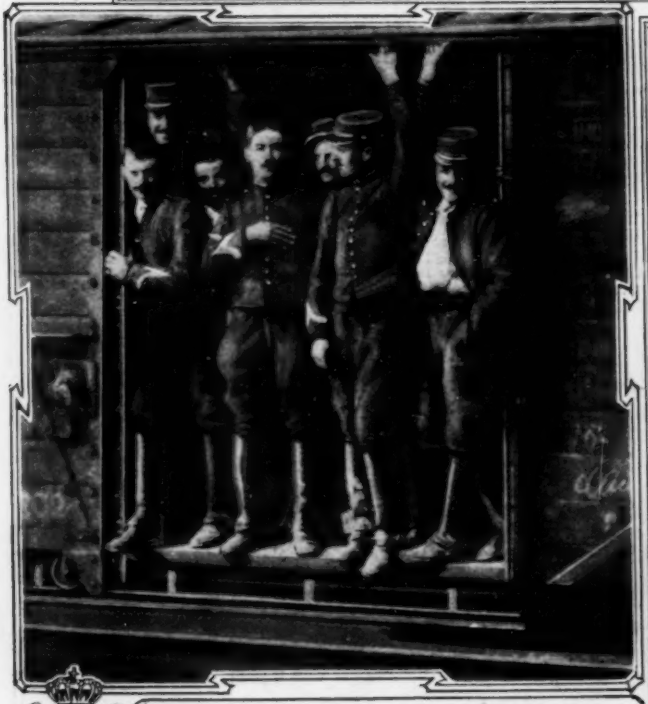
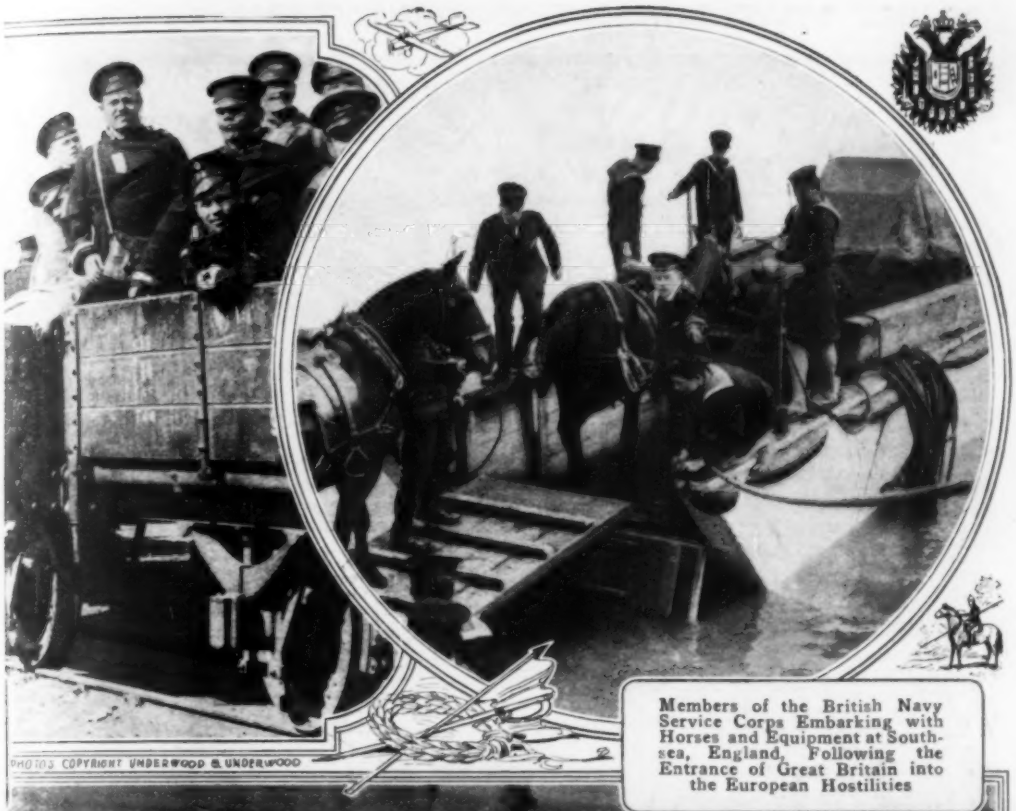
A Detachment of Russian Infantry Marching along the Railroad Line to the German Frontier

Every Available Kind of Car was Forced into Service in Pushing Russian Troops to the Border. Thousands of Soldiers were Entrained in Short, Open Cars in Which They Made the Entire Journey without Shelter



Thousands of French Soldiers were Entrained at Troyes, Where the Railroad Stations during the Movement of the Troops Bore the Appearance of Army Posts. Hundreds of Soldiers Bivouacked around the Terminals When Trains Were Delayed



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Members of the British Navy Service Corps Embarking with Horses and Equipment at Southsea, England, Following the Entrance of Great Britain into the European Hostilities

French Soldiers Returning to Camp with Cattle at the End of a Foraging Expedition. The Problem of Feeding an Army Is Often More Serious than That of Meeting the Attacks of the Enemy and Necessitates Drawing upon the Country for Miles to Find Food

RUINS THAT MARK THE FIERY TRAIL OF WAR

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This Burned Farmhouse, Near Liege, is But One of Thousands

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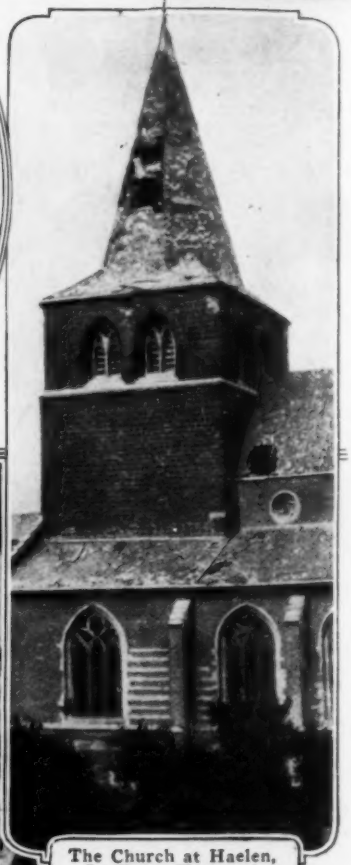
Result of the German Bombardment of Haelen, Belgium



The Church at Haelen, Its Spire Shattered by German Shells

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Rows of Houses at Mouland, Shattered and Set on Fire by German Shells

HOW WAR LOOKS CLOSE TO THE FIRING LINE

Timber Barricade across a Street in Brussels, Ready for the German Invasion

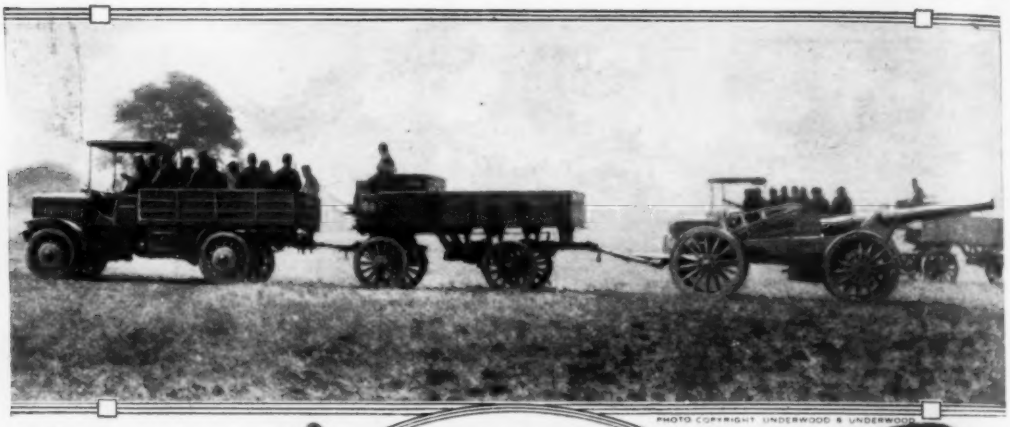
Another Brussels Barricade of Sacks of Sand and Cement, to Provide Breastworks for the Town's Defense

Near Haelen, Where Many Horses were Killed in the Cavalry Engagement

Belgian Infantry Awaiting the German Approach near Louvain

PHOTOS BY INTERNATIONAL NEWS SERVICE

THE USE OF MOTOR CARS IN MILITARY OPERATIONS



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French Army Machine Conveying an Aeroplane to the Front

Above: English Artillery Using Motor Trucks as Tractors for Field-pieces. Right: Austrian Motor Fort. Below: Airship Gun on a German Motor

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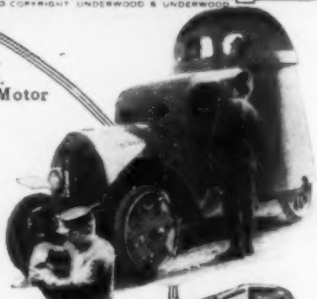

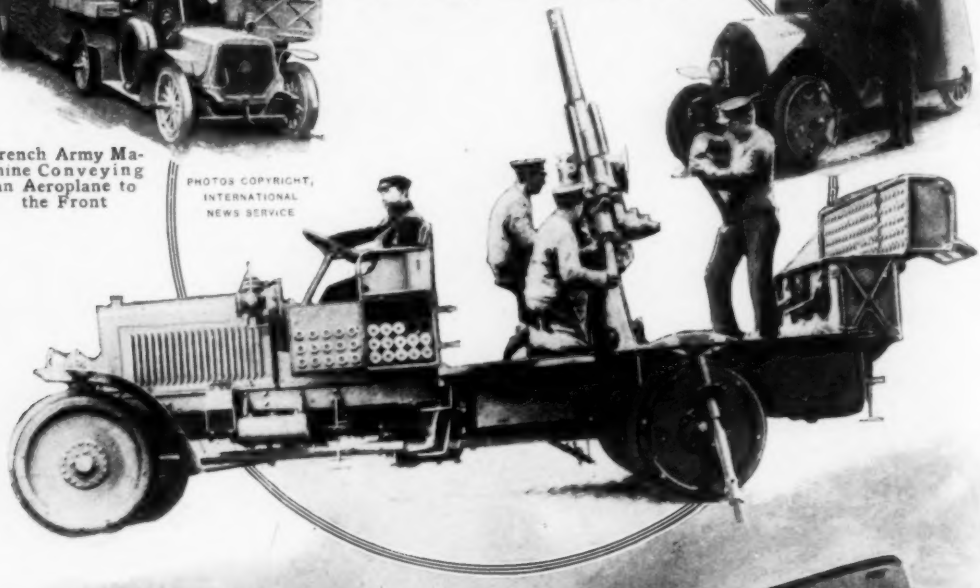

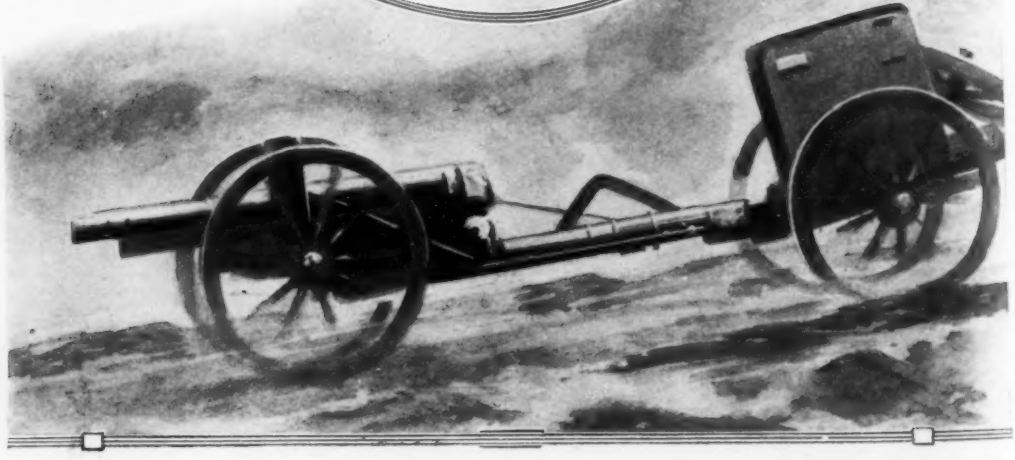

ANOTHER NOVEL FEATURE OF THE PRESENT WAR

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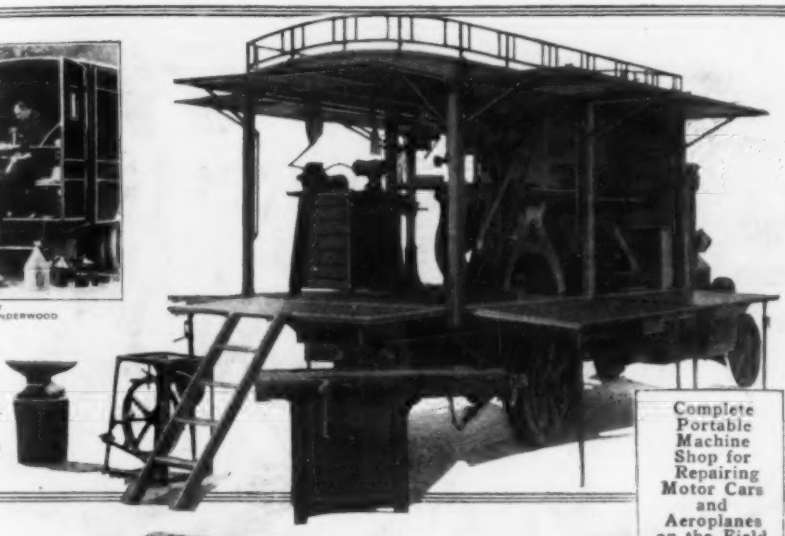
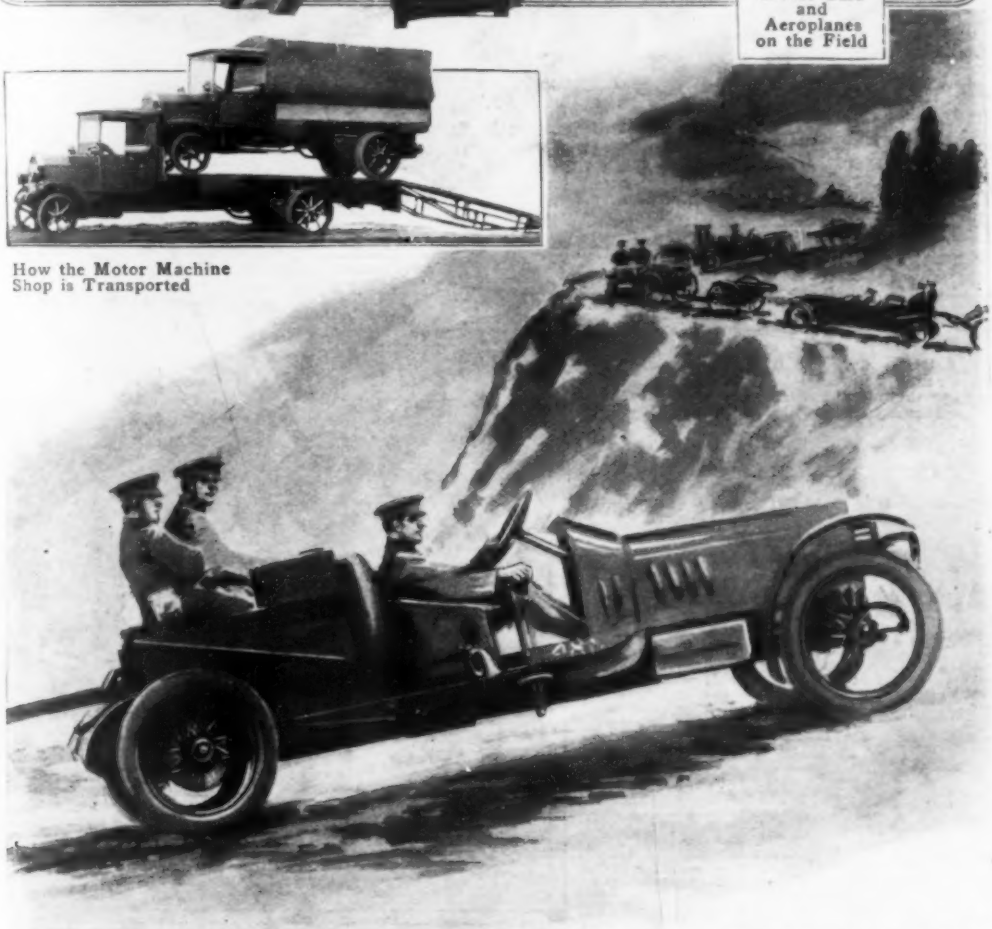
Kitchens Built on Motor Trucks Are at the Command of German Officers



Complete Portable Machine Shop for Repairing Motor Cars and Aeroplanes on the Field

How the Motor Machine Shop is Transported



English Artillery being Rushed Overland by Light Roadsters, Many of Which were Requisitioned from Private Owners

FRENCH ARMY MOBILIZING TO RESIST INVASION,

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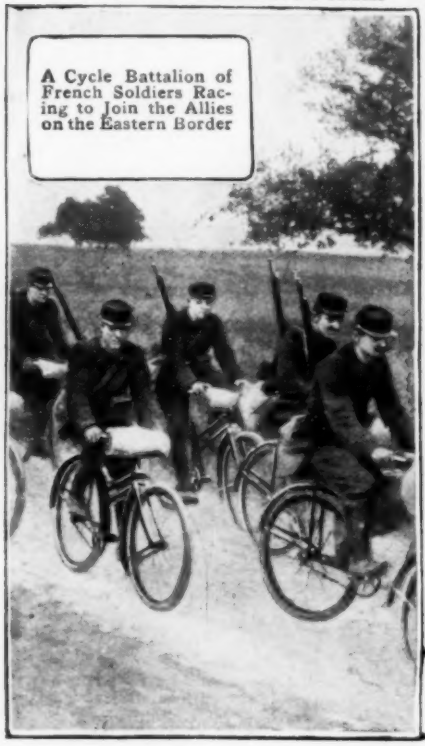

A Cycle Battalion of French Soldiers Racing to Join the Allies on the Eastern Border

Above, Left: A Detachment of French Infantrymen on the
Below: Thousands of Posters of "Bouillon Kub," a German
of Hostilities. It was Discovered that These were Cleverly
to an Invading Army. Different Shapes and Colors Showed
Warning of Mined Ground. One of Them is to be Seen at

AND ITS INFANTRYMEN IN ACTION ON THE FIELD

Above: French Infantrymen, in Heavy Marching Order, Swinging into Action. Left: Dogs of War in the French Ambulance Corps, Which Search for Wounded and Carry First-Aid Materials to Them

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Skirmish Line, Advancing for a Flank Attack. Soup, Spotted the French Countryside at the Opening Arranged to Give Information of a Military Character Where There Was an Abundance of Food and Gave the Left of the Building Shown in the Photograph.

Enthusiasm Ran High at Paris Where Women, Bearing the Tricolor, Frequently Led Reservists through the Streets to Railway Terminals for Entrainment

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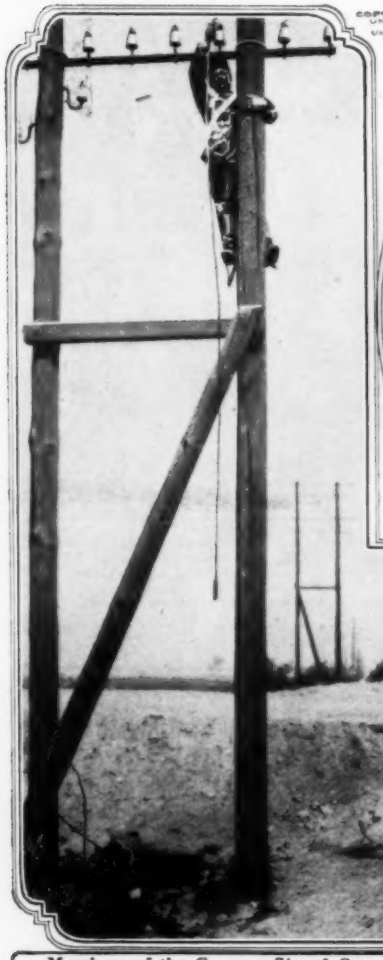
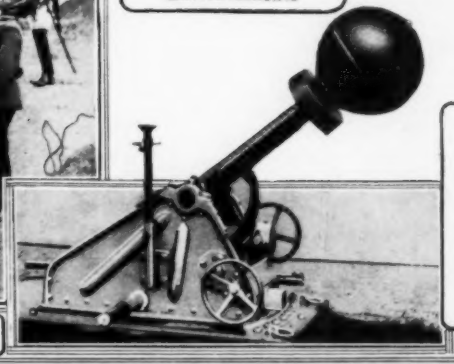
SETTING STAGE IN EUROPE'S THEATER OF WAR

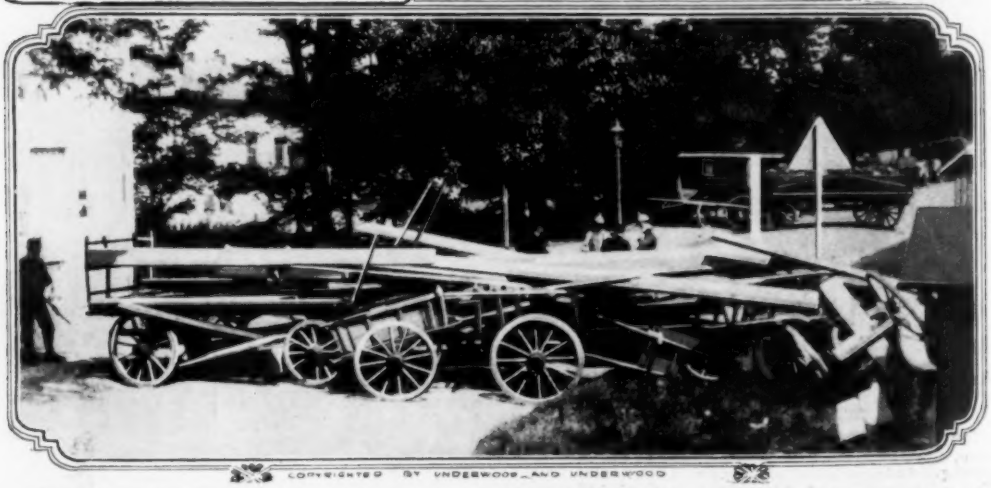


Members of the German Signal Corps Cutting Continental Wires

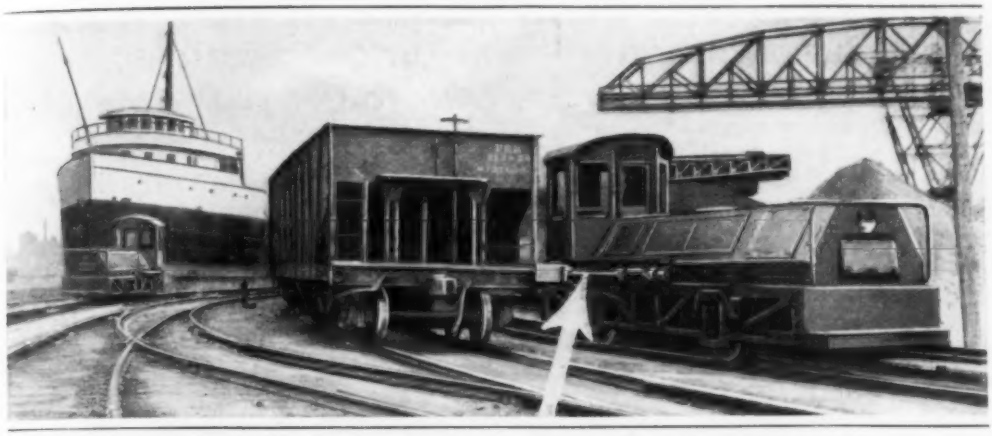
Austrian Infantry Corps Occupying a Strategic Position Digging Entrenchments



One of the British Army's Heavy Bomb Guns Used to Raze Barricades and Ramparts



Roads Crossing the Swiss-German Frontier are Barricaded to Restrain an Invasion by the Germans



Electric Switching Locomotive with Pusher Arm in Place for Moving Car: When Not in Use the Pusher Arm is Drawn In against the Side of the Locomotive

ELECTRIC LOCOMOTIVE WITH PUSHER ARM

Electric switching locomotives of unusual design have been placed in service for sorting and distributing cars at the ore docks at Cleveland, Ohio. These locomotives run on a narrow-gauge track, alongside and parallel with that on which the cars to be distributed are standing, and handle the cars by means of a pusher arm that is pivoted to the side of the locomotive. When a string of cars is to be moved this arm is simply placed against a rear corner of the last car, and the entire string is pushed to the required point. The arm is raised and lowered by compressed air, the movement being regulated by a control valve in the cab. Each of these locomotives is capable of pushing an entire ore train, but the special value of the pusher arm lies in the facility with which sections of cars at the forward end of the train can be cut out and taken to their destination without the necessity for making couplings or for moving the entire train.

FOLDING REVOLVING FAN FOR POCKET USE

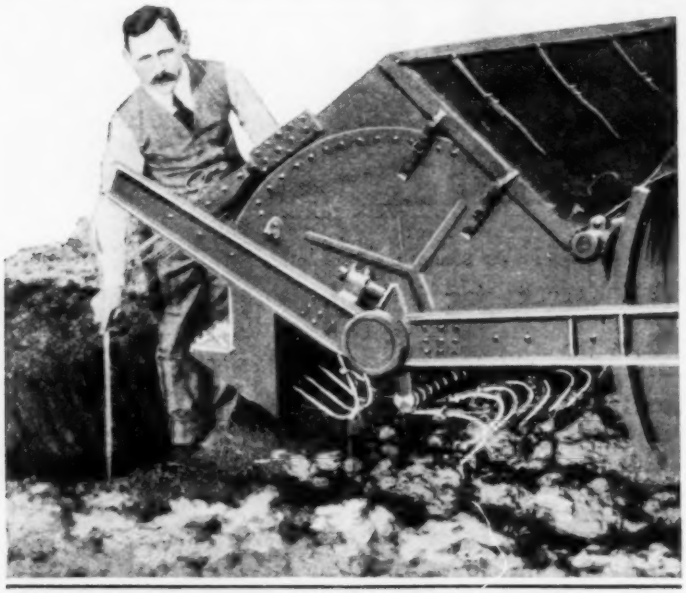
One of the several novelties which have been developed since the tango gained its popularity, and which, like many others, derives its name from the dance, is a small three-bladed revolving fan which may be folded into a compact piece and carried in a pocket or handbag as easily as an electric flashlight. By pressing with the thumb upon a buttoned plunger the vanes may be made to revolve rapidly, supplying a cooling breeze. The device is a French invention.

"Tango" Fan Operated by Pressure of Thumb

¶A fireproof train, built almost entirely of steel, is soon to be put into service between London and Edinburgh.

PLOWING MACHINE THAT PULVERIZES SOIL

A gasoline-driven machine that is now being manufactured commercially in France and England and is being introduced in this country embodies a comparatively new principle in plowing, since the soil is not simply turned over as in ordinary plowing, but is thoroughly pulverized to a considerable depth. This is accomplished by steel hooks fixed to a revolving drum which is carried at the rear of the machine and is power-driven.



Rear View of the Plowing Machine, Showing How the Steel Hooks are Carried on the Revolving Drum

KILLING OF INDIA TIGERS HAS SERIOUS RESULTS

As a result of the campaign which has been carried on in several districts in India to exterminate tigers, wild pigs have increased enormously in numbers within a comparatively short time, and are said to be doing material damage to the crops. This has compelled the natives to put careful guard over their fields.

DEDICATE FIRST COMPLETED PART OF LINCOLN HIGHWAY

The first completed section of the Lincoln Highway, which is to connect New York and San Francisco, consisting of 1,500 ft. of concrete pavement on the strip of the road between Geneva and Aurora, Ill., was dedicated during the summer. The drive passes the industrial farm of the Loyal Order of Moose, which appropriated $6,000 toward its construction. Its building was under the supervision of the Illinois State Highway Commission. Approximately 200 ft. of pavement on the section, which is 18 ft. wide, was laid daily while the work was in progress. Joints, set at an angle of 70° and protected by plates, were laid 50 ft. apart to allow for expansion and contraction. Concrete will be the principal material for the entire Lincoln road.

HOW GERMAN AIRMEN ARE CLASSIFIED

In the aerial service of the German army and navy the standing of each airman is based strictly on his efficiency as demonstrated day by day, and to this, more than to any other feature, is attributed the high degree of efficiency to which this service has been brought. German military and naval airmen are grouped into two classes. In the first class are those pilots who fly every day without regard to weather or other conditions, while all others belong in the second class. This classification is enforced rigidly, and failure to fly for a single day automatically reduces a pilot to the second class.

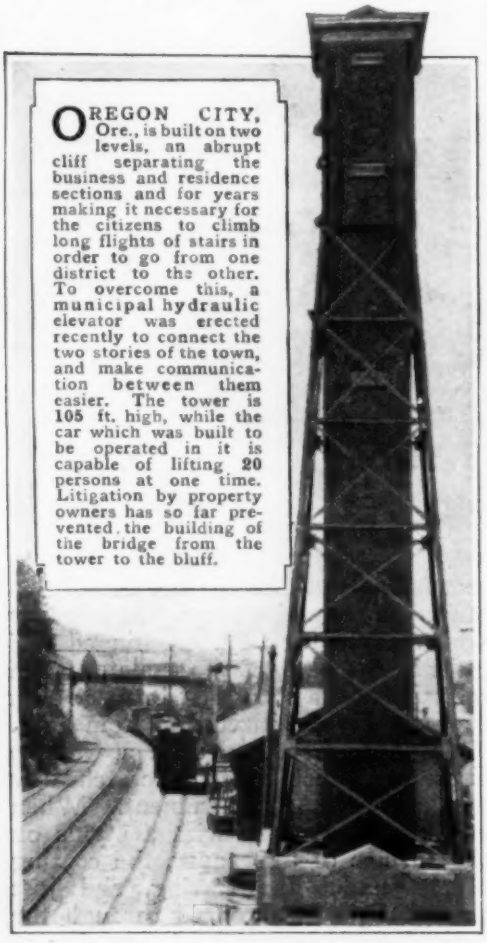
IDENTIFY PHOTO NEGATIVES WITH AUTOGRAPH CAMERA

The Autographic Camera, Which Enables the Photographer to Label His Pictures as He Makes Them. Below: How the Writing Shows Up on the Finished Print

An autographic arrangement which enables a photographer to make a permanent record on a negative in a roll-film camera, identifying a picture at the time the exposure is made, has been invented, and the patent sold by the inventor for $300,000. The object is effected through the use of two strips of especially prepared paper which cover the film. A hinged leaf built in the back of the camera, when opened, bares a strip of red paper which protects the sensitized film from light. This paper is coated with a waxlike substance which is easily scratched by a sharp-pointed instrument. When anything is written with a stylus on the surface of this paper, the coating breaks under the tracing, and just enough light is admitted through the inner paper to make an impression of the words on the negative. When a picture is taken, before turning the film preparatory for a second exposure, the operator opens the leaf door and writes an identifying inscription. Upon developing the film this writing appears on the margin of the negative. The tourist who develops a large number of films several weeks after they were exposed, thus escapes the customary difficulty in identifying his pictures.

¶A project now seriously considered is a ship canal to connect Pittsburgh with Lake Erie and to be located through the Beaver and Mahoning valleys.

MUNICIPAL ELEVATOR BUILT FOR TWO-STORY TOWN



OREGON CITY, Ore., is built on two levels, an abrupt cliff separating the business and residence sections and for years making it necessary for the citizens to climb long flights of stairs in order to go from one district to the other. To overcome this, a municipal hydraulic elevator was erected recently to connect the two stories of the town, and make communication between them easier. The tower is 105 ft. high, while the car which was built to be operated in it is capable of lifting 20 persons at one time. Litigation by property owners has so far prevented the building of the bridge from the tower to the bluff.

DENVER TUNNEL TO PIERCE CONTINENTAL DIVIDE

Within a short time work will be begun on the Moffat tunnel which is to pierce the Continental Divide with a 6.04-mile bore under James Peak in Colorado, giving the Denver & Salt Lake Railway a cut of 23 miles in its route through the mountains. At present the road crosses the range at an elevation of 11,660 ft., while the tube will reduce this to 2,500 ft. The construction of the tunnel will be under the direction of the Moffat commission, a division of the city government of Denver, which is to bear $3,000,000 of the $4,500,000 that the project is estimated to cost. The railroad company will pay all the interest on the city's bonds and also create a fund with which to wipe out the indebtedness at the end of 50 years. During this time the city will own the tunnel, while it reserves the permanent right to allow other railroads within a certain radius to use it at a fixed rate, and also to bring water and electrical energy to Denver. The present plans include laying two 54-in. water mains through the passage, and an irrigation company already has offered to lease the water rights, until they should be needed by the city, at a rate which would mean an annual return of approximately $400,000 to the municipality.

PLANS FOR DOUBLE-DECKING BROOKLYN BRIDGE

The project of double-decking the Brooklyn Bridge, which has been promoted at intervals during the past 10 years and has never been entirely dropped, is now being revived with a greater likelihood than ever that it will be carried through. The plans prepared by the New York bridge department contemplate building the new deck above the present deck. It is to be used principally for pedestrian traffic, although provision will be made for one trolley line. On the lower level all other surface and elevated lines will be placed. This is recognized as the cheapest and easiest way of providing the facilities practically of a new bridge between Manhattan Island and Brooklyn, as the strength of the cables and anchorages are so much in excess of present requirements that they would be sufficient for the added load, and only minor changes in the existing structure would be necessary. There are now four bridges devoted to street traffic spanning East River. Of these the Brooklyn Bridge is the oldest, having been finished in 1883 and constituting for the following 21 years the only means, other than ferries, for transportation across the river.

MAKING AMMUNITION FOR NAVAL GUNS
THE RISKY BUSINESS OF IONA ISLAND

This Compressed-Air Engine Operates between the Powder and Shell Magazines and Cartridge Stores, at Times Hauling Cargoes of Ammunition Sufficient to Destroy a Squadron of Battleships

Fifty Pounds of Black Powder Constitutes the Bursting Charge of the 14-Inch Shell Which is being Filled

CLOSE by the west bank of the Hudson River in the lower passage to the Highlands, and lying between Stony Point and West Point in a region made famous by the Revolutionary War, is Iona Island, the ammunition base of the United States Navy. At this little-known place, a reservation of slightly more than a hundred acres, several hundred men are employed in the preparation of ammunition for the guns of our warships. Back of the hills which seclude most of the island from general view are magazines and storehouses holding ap-

Copper Tools are Used in Loading Rapid-Fire Shells with Their Bursting Charges

The Bag Contains 100 Pounds of Smokeless Powder, a Fourth of the Propulsive Charge for a 14-Inch Projectile

This Shell is Built for the 16-Inch Coast-Defense Guns Guarding Panama Canal, and Weighs 2,400 Pounds

proximately 3,000,000 lb. of smokeless powder, 1,000,000 lb. of black powder, and tens of thousands of shells.

Skirting the island, joining its laboratories and storage places, and connecting with the landing pier is a small railroad, the locomotive of which is operated by compressed air. This is used in the transportation of the deadly cargoes from one building to another and in carrying ammunition to the dock where it is received for the warships. The precaution of having a locomotive which will not throw off sparks, radiate heat nor require connection with high-voltage electric wires is necessary to avert the danger of an explosion. A pipe line carrying compressed air under high pressure parallels the railroad track. When the engine needs a supply of power its storage tank is filled by connection with the air pipe.

Four separate fireproof walls surround each of the magazines, which are divided into compartments in order to safeguard against the complete destruction of the works in the event of a fire or small explosion. Careful inspection of all of the cartridge stores and powder buildings is made at frequent intervals during both day and night. After sundown every visit at one of these places is recorded at the administration building by electric instruments. Close attention is paid to the temperatures wherever explosives are kept, the heat being regulated to remain between 85° and 90° at all times. The interior walls and floors of the magazines are so made that not a single piece of iron or steel is exposed. Upon entering one of the structures inspectors and workmen wear a special kind of clothing and soft shoes without nails, carrying absolutely nothing composed of iron nor anything which in any possible manner might produce a spark.

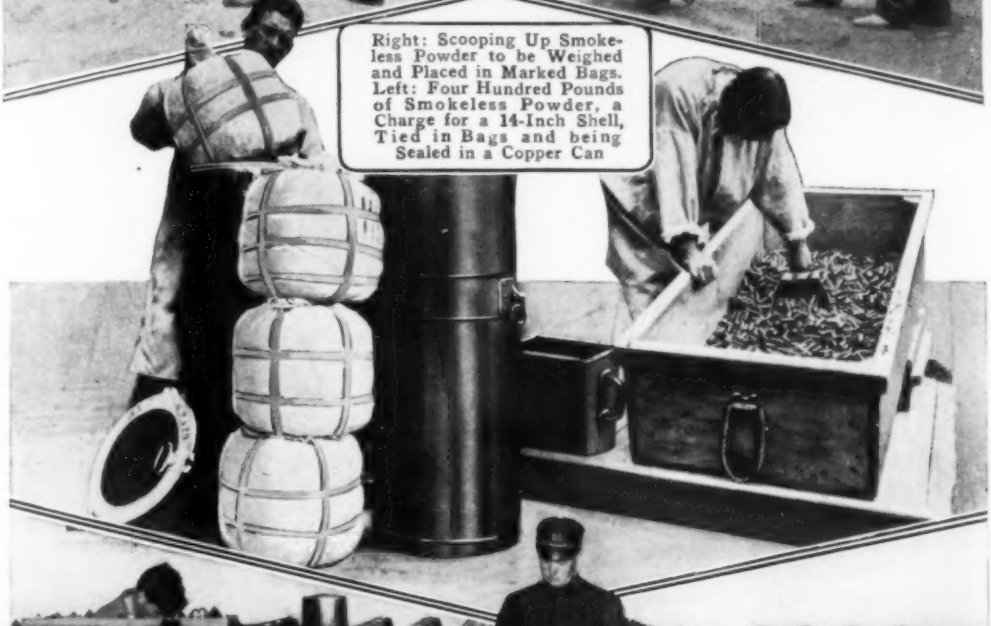
Similar precautions are taken in the filling rooms, where the charges are placed in the shells. Here everyone is dressed in white serge, and the tools, such as measuring cups, scales, and funnels, are made of copper, which does not give off sparks even when struck by stone. The supply of powder to be used during the day is brought to the filling rooms each morning, where it is emptied into a long wooden trough. Over half of the smokeless powder used here is manufactured at the navy proving ground at Indian Head, Md., while the rest is supplied by private firms at the rate of 70 cents a pound.

In loading one of the large steel shells with its bursting charge composed of black powder, the projectile, which in some cases weighs between 1,600 and 2,400 lb., is set nose down in a wooden rack. The cavity in the core is lined with a thin narrow cloth bag, and a carefully weighed quantity of explosive is poured into this through a copper funnel. In the case of a 14-in. shell this amounts to 50 lb. When the work is completed the exterior of the shell is chalk-marked with its size, weight, and style, and is then loaded for transportation to a storehouse. The charges of smokeless powder which comprise the propelling explosive for the shells are weighed, packed in cloth bags, and sealed in copper cans ready for use. Upon each of these bags is stamped the date of the filling and the weight of the powder it contains. In the bottom of each bag is stored a small quantity of black powder to act as an ignition, or priming, charge for the smokeless powder. Fourteen-inch guns require a propelling charge amounting to 400 lb. This is filled into four separate bags, each of which is tightly bound, and stamped. The bags are placed in one large can and returned to the magazine for storage. The date of the filling is stamped in order to safeguard against spontaneous explosions resulting from possible deterioration of the powder through age.

¶The waste made by cleaning sisal fiber, in the Bahama Islands, has been found a good substitute for horsehair for use in upholstery. The product is twisted into rope and dyed. When unwound it remains springy.

It Requires the Strength of Several Men to Pull One of These Heavy Projectiles. This Picture was Taken aboard an Ammunition Barge at the Iona Island Landing Pier When Large Shells and Thousands of Pounds of Explosives were being Taken to the Battleships at the New York Navy Yard

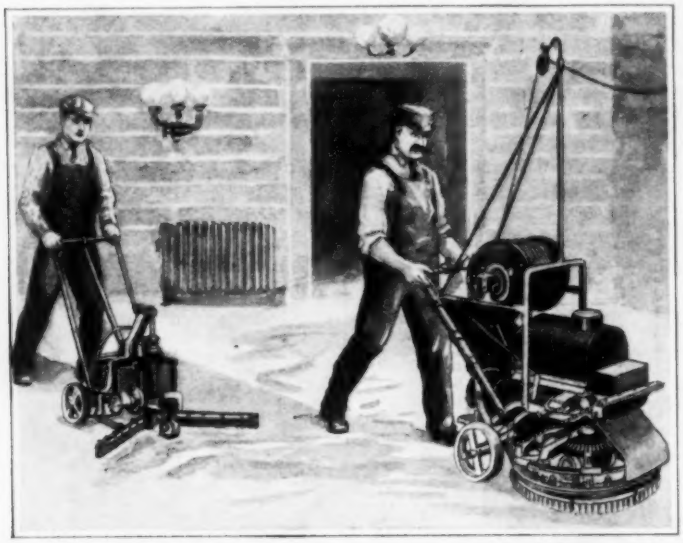
Right: Scooping Up Smokeless Powder to be Weighed and Placed in Marked Bags. Left: Four Hundred Pounds of Smokeless Powder, a Charge for a 14-Inch Shell, Tied in Bags and being Sealed in a Copper Can



When Projectiles are Taken to One of the Magazines They are Marked with Their Size and Weight, and Then Either Stored or Prepared for Shipment to Some Battleship. Even in These Places Every Possible Precaution is Taken Against Producing a Spark

MACHINES FOR SCRUBBING FLOORS

Scrub women employed in big office buildings have come to be regarded as an established institution in most of the larger cities, but it now looks as if they would soon be displaced by machines capable of doing the work faster and more economically. A rotary electric machine now being introduced has a capacity of from 5,000 to 8,000 sq. ft. of floor surface an hour, and is both rotated and propelled by electric power. Power is supplied through an insulated wire which may be attached to any standard socket and which is taken up and paid out as required by an automatic reel carried on the machine. The water, which is mixed with a cleansing powder, is carried in a 10-gal. tank placed just above the rotary brushes of the scrubbing device.



Electric Machine Capable of Scrubbing from 5,000 to 8,000 Square Feet of Floor an Hour; the Wheeled Squeegee is Operated by Hand

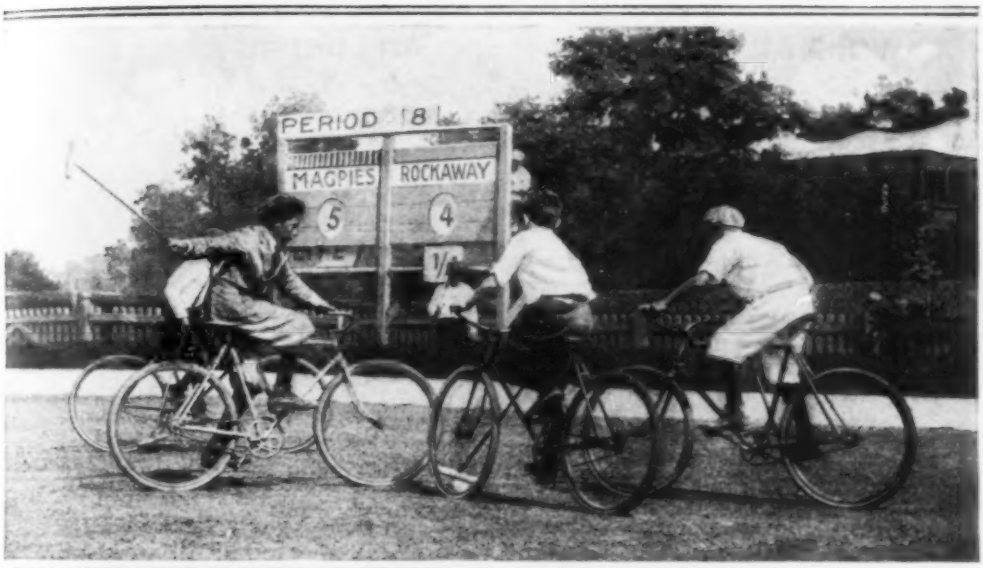
Accompanying the scrubber is a smaller machine, propelled by hand, which is simply a squeegee on wheels. The squeegee has two arms placed at an angle so that the water collects at the middle, where it is taken up and deposited in a tank by a pump which is chain-connected to one of the rear wheels of the machine.

FLUMES FOR TRANSPORTING TIMBER

Flumes for transporting timber, to be efficient, have to be located and built with about as much care as a railroad, and they often cost as much as from $2,000 to $8,000 a mile. In a bulletin issued by the Department of Agriculture it is stated that the V-shaped timber flume is more efficient than the box, or square-sided, form, since it requires less water, is less costly to maintain, and offers fewer chances for the formation of jams. For handling logs, piling, and other heavy timber, a flume from 40 to 60 in. high is recommended, while for railroad ties, and small timber generally, a height of 30 in. is thought to be sufficient. The best angle for the V is put at 90°. The prediction is made in the bulletin that the sectional metal flume, semicircular in form, will come into wide use, since such a flume is strong and light, and can be quickly taken apart and transported from place to place as required. Abrupt curves are to be avoided, as they are likely to cause jams, and the grades should not exceed 15 ft. in 100 ft., the best results having been obtained with grades ranging from 2 to 10 ft. in 100 feet.

BICYCLE POLO IS NEW GAME PLAYED BY BOYS

Polo played on bicycles instead of ponies is a variation of the international sport which has been invented by a group of Long Island boys having access to the Rockaway Hunting Club. The game is played on the same turf where many of the big eastern polo matches are contested, and is governed



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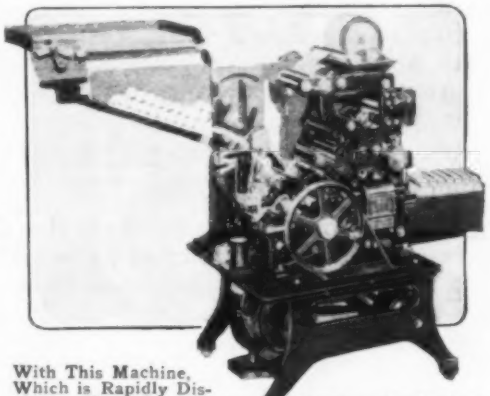
An Exciting Play in a Bicycle-Polo Match between Two Rival Teams

in essentials by the official rules. It has gained such local popularity that several juvenile teams have been organized, which play exciting matches on the club grounds, often attracting interested groups of spectators from among the members of the club. There is more or less real skill connected with the pastime, since to play it well a boy must display dexterity on a bicycle, a thing just as essential in this sport as a well-trained pony in the real game. Bunching and crowding, sometimes coming at each other head-on, and often disentangling themselves without even a stop, the boys handle their wheels with considerable skill and play a quite exciting and fast game.

MACHINE THAT COUNTS AND WRAPS COINS

Counting coins and wrapping them in crimped cartridges, containing 10, 20, 40, or 50 coins as desired, is accomplished automatically by a new machine that is now being introduced in banking institutions and is rapidly displacing the system of hand-counting. This machine counts and wraps coins of 1, 5, 10, 25, or 50-cent denominations at the rate of 350 coins a minute, rejects counterfeits, and deposits the wrapped coins in a tray at the back of the machine and the counterfeits in a "false-coin" tray at the bottom. The machine is run by an electric motor and is controlled by five levers, one for each class of coins. Each lever controls 31 different parts of the machine, which all move when the lever is operated.

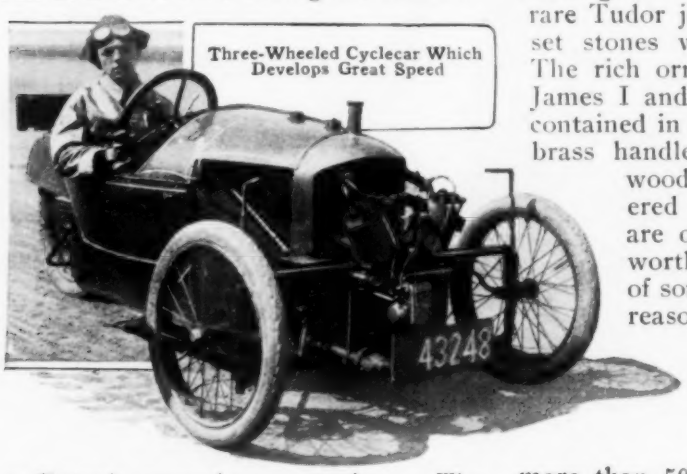


With This Machine, Which is Rapidly Displacing Hand-Counting in Banking Institutions, Coins of Five Denominations are Counted and Wrapped, and Counterfeits are Rejected

¶Two submarines are being towed by cruisers from San Francisco to Honolulu, a distance of 2,200 miles.

QUEER-LOOKING CYCLECAR WINS AT DETROIT

An English-made cyclecar entered in a one-mile free-for-all race, which was run at a meet held during the summer



Three-Wheeled Cyclecar Which Develops Great Speed

at Detroit, proved an easy winner. The light machine attracted attention because it was of the three-wheeled type, uncommon in this country but gaining in popularity abroad. It has a seating capacity of only one person and is built low, but its wheel arrangement makes it practically impossible to tip over, regardless of the speed at which it attempts to negotiate a turn. It is fitted with a two-cylinder engine, attached in front of the radiator.

REMODEL FRENCH LAUNCH TO PRESENT TO NATION

As a token of the good will existing between the United States and France and also in recognition of the services performed by that nation in the building of the Panama Canal, the steam launch "Louise," which was originally used by the French company in its work at the Isthmus, is to be repaired, refitted, and presented to the republic. The craft was used for some time by this country in its first operations. It will be given a place of honor in the procession of vessels passing through the canal at its official opening and will then be taken to France, according to present plans.

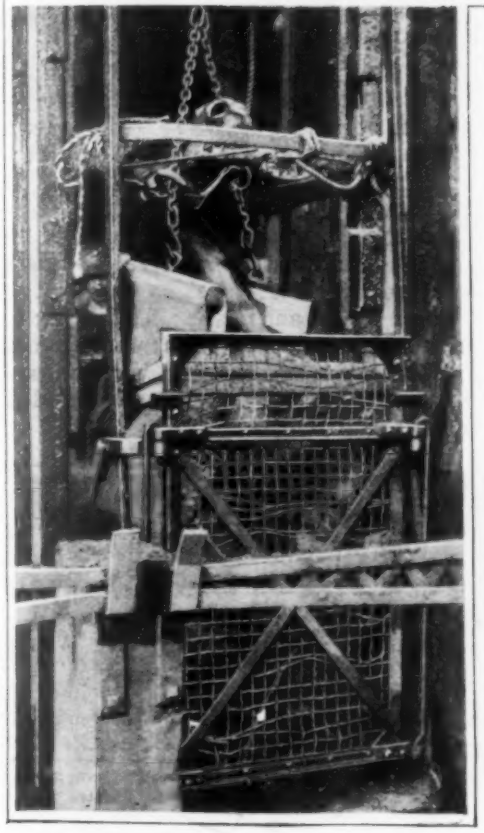
JEWELRY CENTURIES OLD IN LONDON BASEMENT

During the course of some excavation work in the basement of a London building a remarkable collection of rare Tudor jewelry and valuable unset stones was recently uncovered. The rich ornaments, of the time of James I and earlier dates, had been contained in a box of which only the brass handle and a few shreds of wood remained. It is considered that the jewels, which are of material archeological worth, constituted the stock of some jeweler who for some reason or other buried the chest under the floor of the cellar, where it was found 16 ft. from the present surface. The collection, representing more than 50 pieces of magnificently made ornaments, all rich with jewels, has been purchased by one of the trustees of the London Museum.

"SAFETY-FIRST" EMBLEM FOR STREET CARS

A safety-first emblem that is now being introduced by the street-car companies of several middle-western cities is painted conspicuously on the front of each car so that it catches the eye instantly and serves as a constant reminder of the necessity of caution. This emblem consists of a modified Maltese cross painted in bright red and encircled by two black borders, the outer one of which is 30 in. in diameter, with "Safety First" painted in black on the white background inclosed by the borders.

Tying a Mule Before Lowering It into the Mine
Below: Animal Secured in Elevator Ready for Descent



LOWERING MULES INTO MINE IS OFTEN HARD TASK

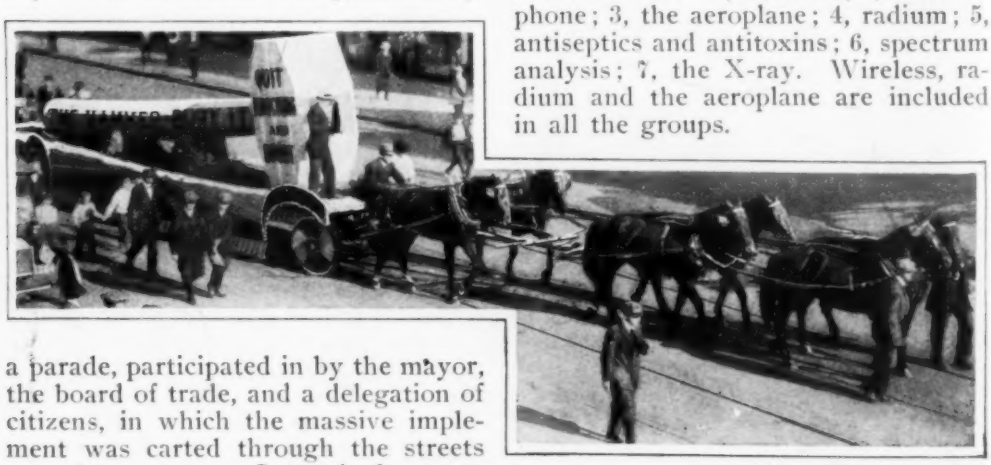
In large mining districts where horses and mules are employed in the tunnels, the methods used in lowering the animals down the shafts to the various levels are interesting. The elevator in most cases is only a few feet square and for that reason it is impossible for one of the beasts to be placed in it on all fours. To get around this, it is necessary to securely "hog-tie" it and place its head firmly in a jacket so that it is unable to make a move which might end disastrously. When a mule is fastened in this manner, a heavy leather saddle is strapped about it to protect its back and sides from injury. It is then placed in a sitting position in the elevator and quickly lowered to whatever tunnel it is to be worked in. Once in a mine, the mule often spends the remainder of its life there. In some places, where the task is not too difficult, the animals are brought to the sunlight once a year on some holiday, such as Christmas or the Fourth of July, and allowed to run free.

"MAN-POWER" DELIVERY BY FRENCH STORES

In contrast with the custom in this country, where the smallest purchases are delivered in wagons or motor cars, much of the merchandise sold in Paris shops is delivered on foot by men who make a business of calling each day to get goods to deliver. These men think nothing of walking long distances with heavy burdens, and are held rigidly responsible for the merchandise intrusted to their care.

CITIZENS INTER HAMMER TO END DISCORD

Paterson, N. J., which during the last several years has been the seat of repeated labor disturbances, recently constructed a giant hammer to symbolize the criticism that had been hurled at it, and then, after an elaborate ceremony, buried this in the middle of the city. The interment was preceded by a parade, participated in by the mayor, the board of trade, and a delegation of citizens, in which the massive implement was carted through the streets on a long wagon. Instead of mourning there were shouts of approval at the funeral, the event being decidedly a gala one and intended to renew a spirit of good feeling and usher in an era of prosperity and industry.



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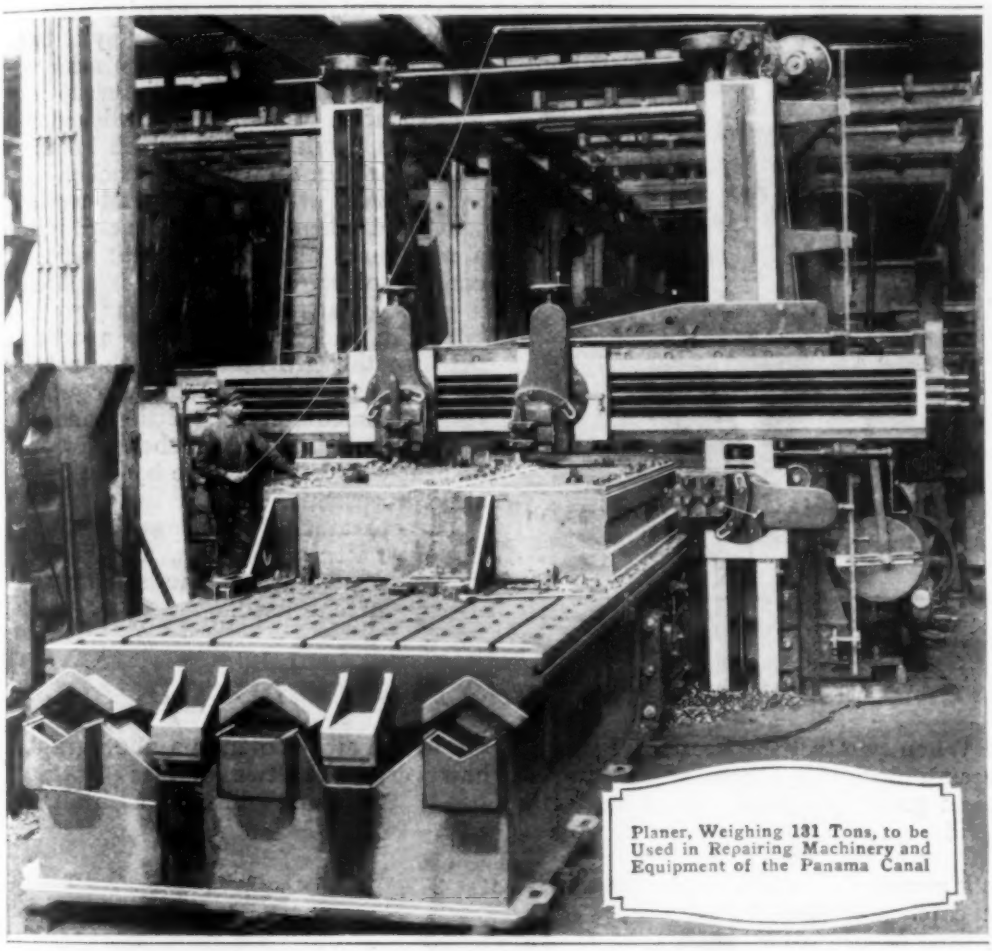
Paterson, N. J., Burying the Hammer After Long Labor Trouble

THE SEVEN WONDERS OF THE MODERN WORLD

The question as to what constitutes the seven wonders of the modern world, which was first asked in 1912 when this magazine submitted the question to the vote of the leading scientists of the world, has been taken up by European publications. A daily newspaper of Berlin recently submitted the question to its readers and received 150,000 replies. The result of this poll, with the relative importance of the different achievements indicated by the numbers, is as follows: 1, wireless; 2, the Panama Canal; 3, the dirigible balloon; 4, the aeroplane; 5, radium; 6, motion pictures; 7, the ship "Imperator." A similar vote taken a short time ago by a daily newspaper of Paris gave the following result: 1, the aeroplane; 2, wireless; 3, radium; 4, the locomotive; 5, the grafting of human bone and organs; 6, diphtheria serum; 7, the electric dynamo. Neither of these polls was international in scope.

In the international poll taken by this magazine the modern wonders selected were: 1, wireless; 2, the telephone; 3, the aeroplane; 4, radium; 5, antiseptics and antitoxins; 6, spectrum analysis; 7, the X-ray. Wireless, radium and the aeroplane are included in all the groups.

BIG PLANER FOR PANAMA CANAL REPAIRS



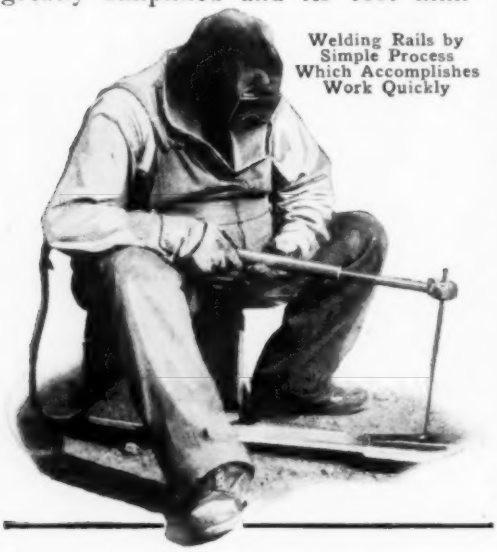
Planer, Weighing 131 Tons, to be Used in Repairing Machinery and Equipment of the Panama Canal

What is said to be the largest machine of its class ever built in this country is a convertible open-side planer recently built for the government and shipped to the Canal Zone, to be installed in the machine shop where all repairs to the machinery and equipment of the canal are to be made. This planer weighs 262,000 lb., and six freight cars were required for transporting it to the boat on which it was shipped to the Isthmus. While the machine can easily be converted into an ordinary two-post planer, it is the open-side feature that makes it particularly adapted to the class of work it is to do, since this permits the handling of pieces of metal many times the size that can be handled in an ordinary planer. During a test given the machine before shipment, three sides of a casting, 3 ft. square and 12 ft. long, were planed simultaneously.

¶The police of Godalming, England, recently conducted a severe campaign against motorists who, they claimed, were exceeding the speed limit. The result has been disastrous for the community, for a boycott upon the town was declared by car owners, and this has seriously affected the general prosperity of the place.

WELD CAR RAILS QUICKLY WITH SIMPLE DEVICE

Street-car rail welding has been greatly simplified and its cost minimized through the adoption of a new method which eliminates entirely the necessity of disturbing the pavement or using expensive apparatus. By it two rails may be joined in a few minutes and without necessarily interrupting night traffic. This is accomplished by using an insulated grip which holds a rod of steel in a cylindrical socket. It is connected with an overhead trolley wire, and when placed in contact with a rail, fuses as if it were the softest core of solder. As the steel is melted, it gives off an intensely bright, greenish light, and flows into the aperture between the two rails, with the result that they are welded securely together almost immediately. A little grinding levels the surface and finishes the work as neatly as though done by the ordinary process.

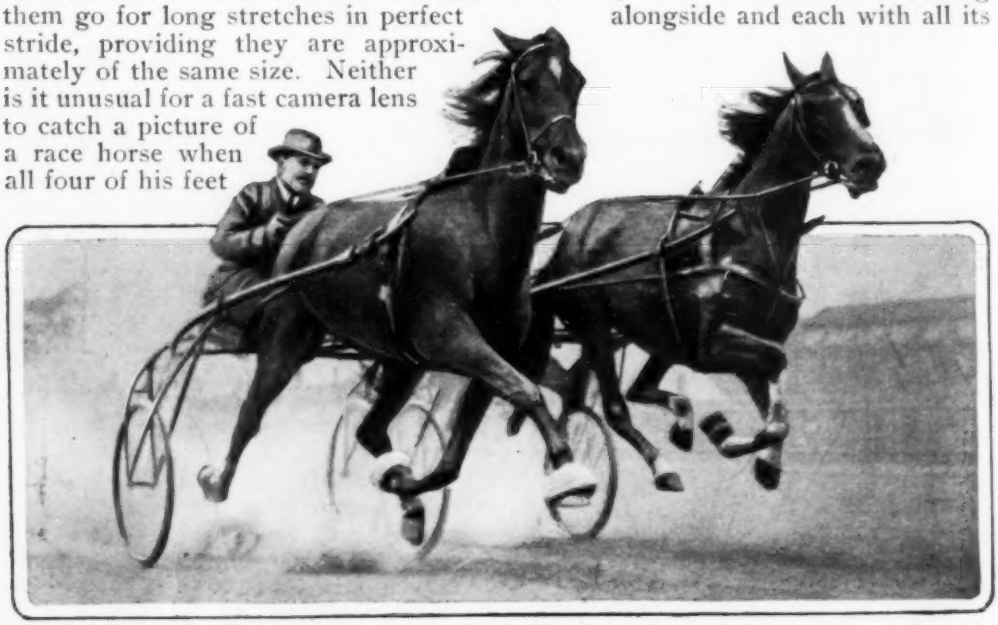


Welding Rails by Simple Process Which Accomplishes Work Quickly

The operator wears a mask to shield his eyes from the glare, and rubber gloves to protect his hands from the strong current used.

CAMERA SHOWS TROTTING HORSES' FEET IN AIR

When two trotting horses are racing neck to neck it is not uncommon to see them go for long stretches in perfect stride, providing they are approximately of the same size. Neither is it unusual for a fast camera lens to catch a picture of a race horse when all four of his feet are in the air. To snap a photograph, however, with two horses trotting alongside and each with all its

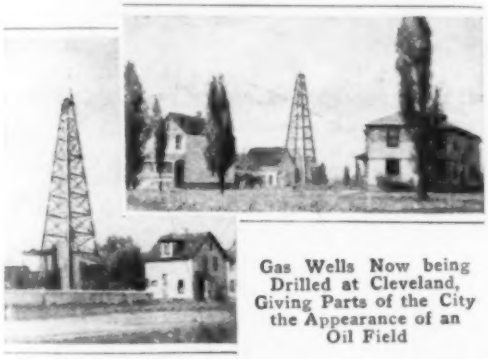


Unusual Photograph Showing Two Trotting Horses, Each with All Four Feet Off the Track

feet entirely off the ground is believed rare indeed, and such an exposure could be made only with an exceedingly quick lens. The accompanying photograph shows two trotters, both off the ground, racing on a California track.

CLEVELAND BECOMING CITY OF GAS WELLS

Since natural gas was first struck at Cleveland several months ago, 110 successful wells have been sunk within the corporate limits of the city. These are now pouring forth a daily volume estimated to be 220,000,000 cu. ft. Nearly a hundred other bores are being drilled at the present time in different parts of the city, giving many of the outlying

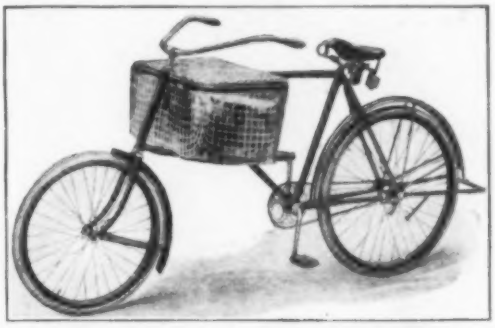


Gas Wells Now being Drilled at Cleveland, Giving Parts of the City the Appearance of an Oil Field

neighborhoods the appearance of a typical oil field. In certain cases, persons of very limited means, who owned small pieces of property, awoke to find themselves the possessors of comfortable incomes. The present production of gas is valued at $5,000,000 a year, while the aggregate value of the wells, so far sunk, is placed at $30,000,000. The original bore is giving out 10,000,000 cu. ft. of gas a day, while one opened several weeks ago is producing 9,000,000. The gas is found at depths varying from 2,450 to 2,750 ft. It is believed that oil deposits ultimately will be discovered. Prior to the sinking of the first well it was considered that only "pocket gas" existed beneath the city, and that it occurred in such small quantities that it was not worth the expense of drilling.

BICYCLE ESPECIALLY MADE FOR PACKAGE DELIVERY

Designed for quick-delivery purposes for neighborhood and small-town stores, a bicycle is being made which



Bicycle Built for Quick-Delivery Purposes

with an especially constructed frame carries a substantial wire basket of sufficient capacity to hold several good-sized packages. The top bar instead of being a straight rod is made to form a square which holds the carrier, while the lower bar is bent upward, furnishing a supporting base for the basket. The cycle is strong enough to carry a load of 250 pounds.

PETRIFIED STUMP OF TREE FOUND IN MINE SHAFT

At a depth of about 65 ft. under the ground, a petrified stump of a large tree was uncovered recently by coal miners who were sinking a new shaft near Alderson, Okla. Its diameter is approximately 4 ft. at the base, while it is 8 ft. in height, and weighs nearly three tons. In order to remove it from the earth the stump was cut into five pieces, and these were taken to El Reno where they were mounted in a parking near one of the railroad stations.

SCREEN THAT DISAPPEARS WHEN NOT IN USE

Free from many of the objections of its forerunner, and equally serviceable, a new window screen which does not

Window Screen That Disappears When Not in Use

darken the interior of a room by covering the glass, is a recent idea in building construction. The screen, on a metal frame, is moved in a channel made of the same material and screwed to the casing. When placed in use it covers only the aperture made by the opening of the window, leaving the pane of glass unobstructed. A small ledge along the top of the screen closes tightly against the bottom of the window frame. In this way, by raising the screen, the window also is moved up, or by lowering the window, the screen, which slides down between the walls through a recess in the sill, is put out of sight. When not needed, the screen always is out of the way.

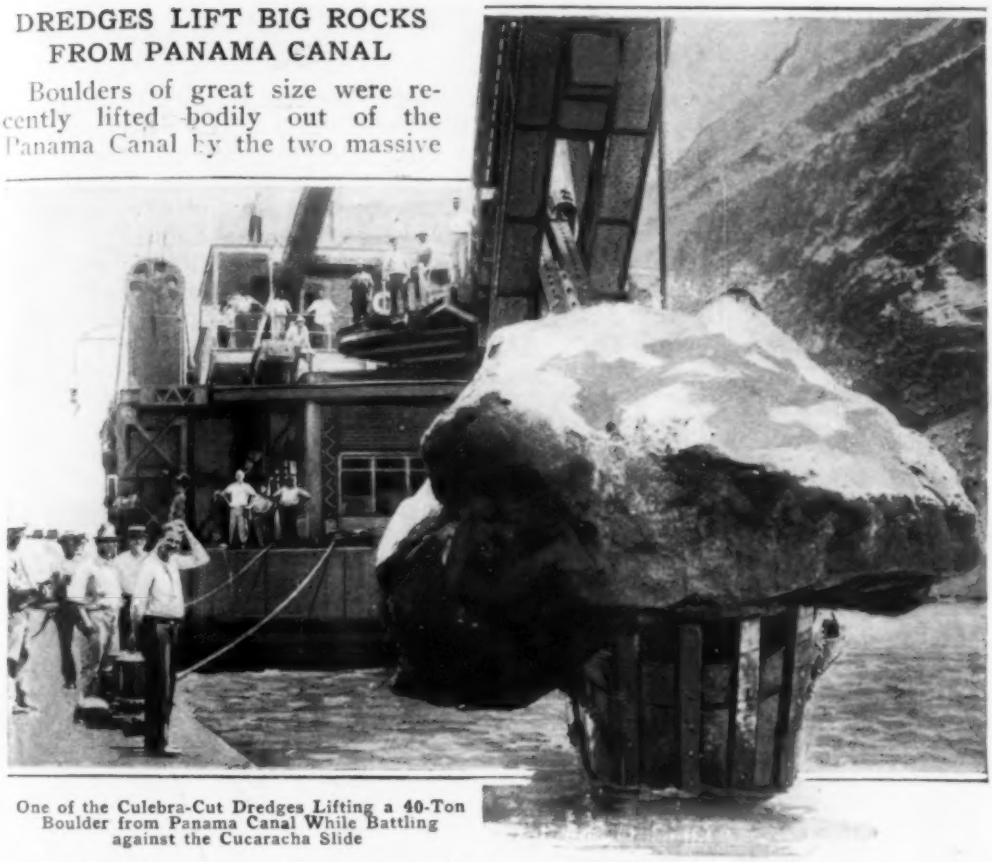
AUTOMOBILE SMASHED BUT CLOCK KEEPS RUNNING

In spite of the terrific force with which a railroad train, running at 60 miles an hour, hit an automobile on a crossing near Omaha, killing its four occupants instantly and scattering the fragments of the car for several hundred feet along the track, the clock attached to the dash was not even stopped and was found to be running when examined on the morning following the accident. It was picked up about 200 ft. from the crossing in the pile of wreckage shown in the photograph.

Some of the Wreckage of a Motor Car Hit by a Fast Passenger Train: The Automobile's Clock, Shown in the Middle of the Picture, was Not Even Stopped by the Terrific Impact

DREDGES LIFT BIG ROCKS FROM PANAMA CANAL

Boulders of great size were recently lifted bodily out of the Panama Canal by the two massive

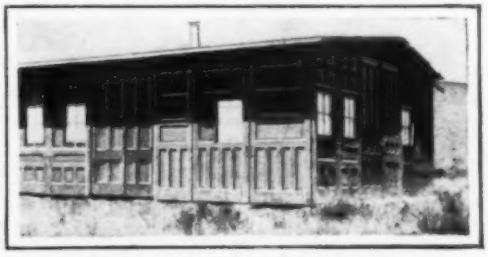


One of the Culebra-Cut Dredges Lifting a 40-Ton Boulder from Panama Canal While Battling against the Cucaracha Slide

dredges which were built to cope with the Cucaracha slide in the Culebra cut. In many instances rocks of tremendous weight were handled by the steel-armed engine, almost as if they were pebbles. The accompanying photograph shows one of these boulders, weighing 40 tons, being lifted out of the water and swung to one side free of the channel. The bucket which holds it has a capacity of 15 cu. yd., or approximately 12 wagon loads.

ODD-LOOKING HOUSE BUILT FROM OLD DOORS

Standing alone in the middle of a large California ranch, and surrounded only by rolling hills and short grass, is a solitary house made almost entirely from old doors. Of the exterior, only the roof is constructed from different material. From a short distance the effect is striking, the series of panels giving the place a most unusual appearance. In several places the windows are formed by those originally in



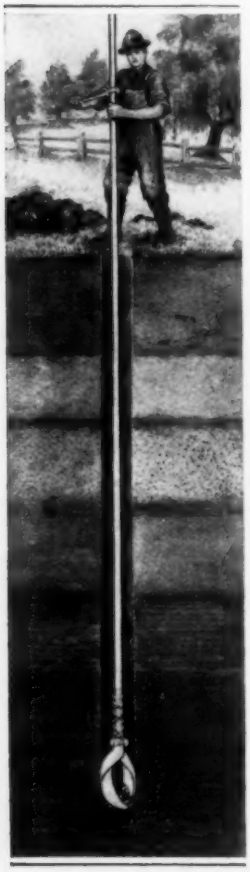
California Ranch House Made of Doors

the doors, while in other instances they have been built in apertures cut in the walls.

¶The world's annual consumption of illuminating gas is estimated at nearly 760,000,000,000 cubic feet.

POST-HOLE AUGER WILL DIG DEEP WELLS QUICKLY

In soil where rocks were not encountered, wells have been drilled to a depth of 60 ft. with a post-hole digger which has lately been invented. The implement is built of two blades so formed as to give an auger-like head, and this, when twisted, will cut into the earth with marked efficiency. By substituting a long piece of gas pipe for the handle and using a wrench to turn the auger, deep holes have been dug within a few hours. When employed for this function, an improvised derrick has been used to lift the drill out of the ground. As the auger is raised its blades close, holding the dirt until it is released.



ARTIFICIAL AVALANCHES FOR MOTION-PICTURE FILMS

Avalanches are being made to order for the benefit of motion-picture photographers by the explosion of mines placed deep in the compacted snow at the upper ends of Alpine glaciers. The mines are connected by cable with a magneto in the valley. When all is ready, a push of the control lever sets off a large charge of gunpowder, and the result is a manufactured snow slide having all the rush and roar of a natural avalanche.

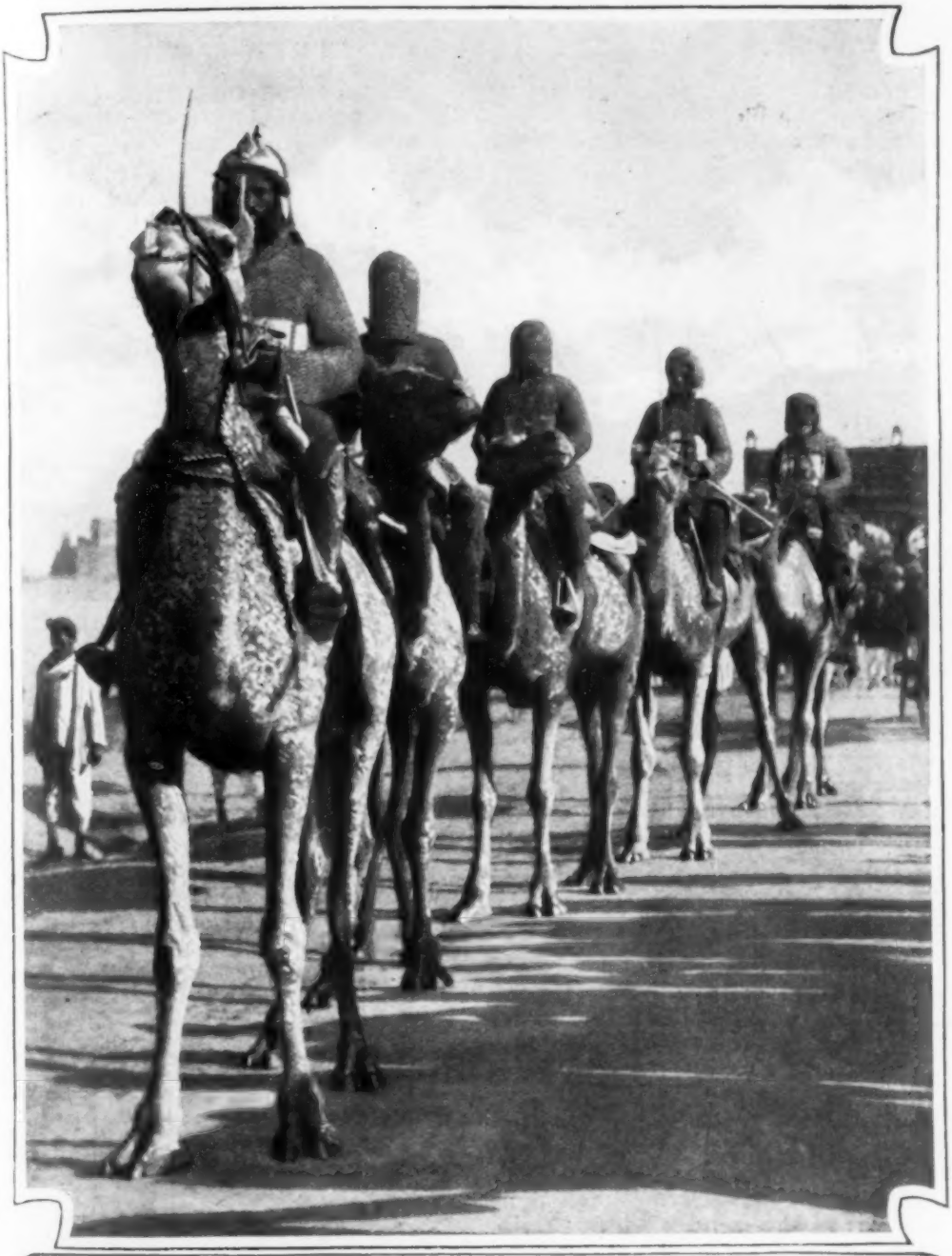
NEW HIGH-SPEED WIRELESS TELEGRAPH

A new system of wireless-telegraph transmission recently demonstrated before a commission of the British government makes it possible to send as many as 100 words a minute, a speed that is beyond the possibility of hand operation. With this system a band perforated with dots and dashes representing the message in the Morse code is run through the apparatus, and the key is operated by electrical contacts made through these perforations. At the receiving station the impulses are received in a telephone and then passed through a loud-speaking telephone and recorded on a phonographic cylinder. The receiving operator simply causes the phonograph to repeat the message at a slow rate and transcribes it from the Morse code into ordinary language.

WOODEN-BLOCK TIRES USED ON HEAVY MOTOR TRUCKS

Wood-block tires are gradually replacing those of solid rubber on motor trucks used for the transportation of ores and lumber over mountainous sections where steep and rocky roads are encountered. Experience has shown that the wooden wheels withstand heavy usage, are comparatively inexpensive, and capable of hundreds of miles of travel over the worst kind of roads. The blocks are held in place on the rim in such a manner that the grain runs parallel with the spokes, placing all the wear on the cross section of the wood, which gives long life to the tire. Usage mushrooms the wood somewhat and gives it a certain amount of resiliency.

SIKHS CALLED THE FINEST SOLDIERS OF THE EAST



CURIOUS in appearance, because of the odd character of their oriental costumes, the Sikh military forces of India form one of the most remarkable fighting organizations in the British possessions. This is true in all branches of the service, including cavalry, which, queerly, is mounted upon camels. The men, who are decked in coats of mail and are protected by helmets, carry long curved sabers. They are classed as the finest soldiers of the East and bear a reputation worthy of the old Spartans. There are 30,000 Sikhs in the Indian army, all members of the Sikh religious sect which gives them their name.

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STEEL HARDNESS TESTED WITH LEVER FILES

For the purpose of measuring the hardness of a piece of metal, an apparatus has been designed which indicates

Penetration of Files in Steel Shows Metal's Hardness

the quality of the material being tested by showing its resistance to the teeth of two files. These are hinged together at one end and set in a frame so as to stand at right angles with each other. The upper one, which acts as a lever, is fitted with a weight, fixed on the tang which extends through a quadrant upon which is marked an appropriate scale. By placing a cylinder of the metal at the vertex of the angle formed by the files, its hardness is determined. If the metal is soft the file teeth catch it quickly and prevent it from rolling, the files standing apart at nearly a right angle. If the metal is hard, it will resist the files and move over their edges to a point where the leverage is sufficient to hold it. The degree indicated on the quadrant shows the relative hardness.

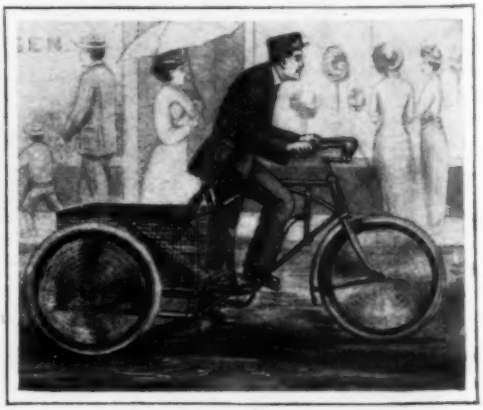
¶For supplying fuel oil to vessels on the Amazon River, two storage tanks, of 7,800 tons capacity, have been completed at Para, Brazil.

ASTRONOMERS FIND JUPITER HAS NEW SATELLITE

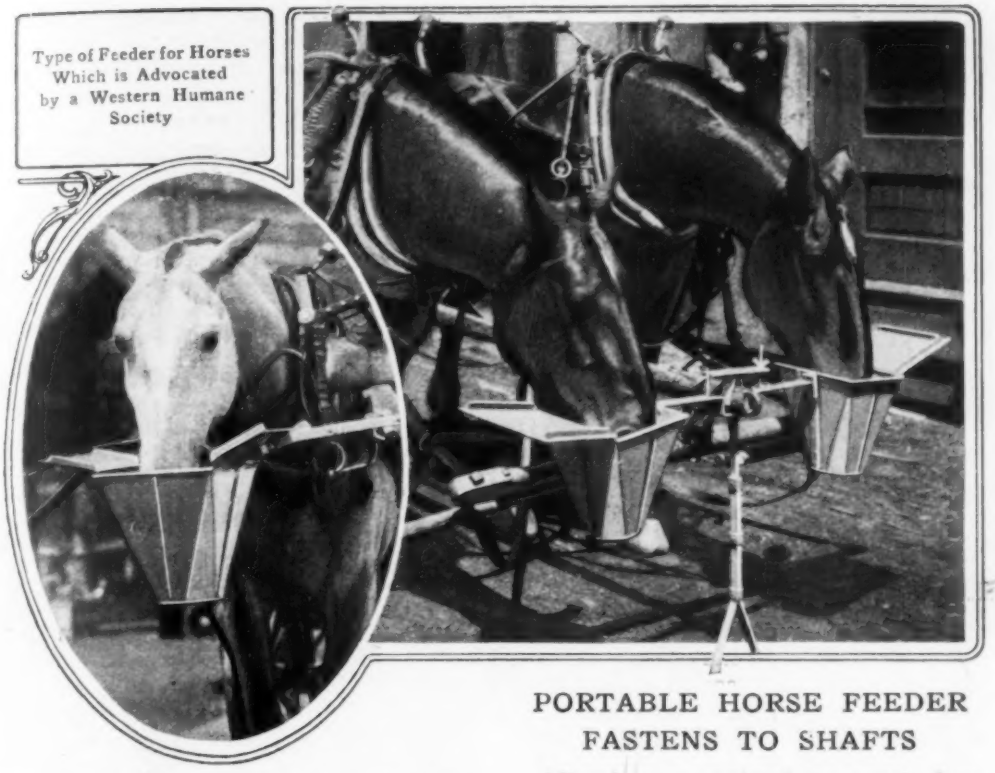
Astronomers at the Lick Observatory are reported as having discovered a new satellite of the planet Jupiter. Telescopic photographs taken on eight successive nights furnished impressions which indicated the existence of a luminous body hitherto uncharted. The secondary planet was sighted near the eighth satellite and is estimated to be about a half magnitude fainter than it. Until 1892 Jupiter was supposed to possess only four satellites, those originally discovered by Galileo in 1610. Since then, however, four others have been found, the latest three through the agency of photography. The most recent discovery gives Jupiter nine moons.

DELIVERY SIDECAR MADE FOR BICYCLES

A sidecar attachment for ordinary bicycles which is intended to be used for facilitating the delivery of small bundles, has been invented. It has a heavy wire-box carrier mounted on springs and is capable of holding a fairly heavy load. The device is attached to a bicycle in about the same manner that the usual sidecar is fastened to a motorcycle, and may be removed readily. The connecting bar is sufficiently curved so as not to interfere with the pedaling.



Sidecar Attached to a Bicycle



Type of Feeder for Horses Which is Advocated by a Western Humane Society

ARTESIAN WATER OBTAINED IN TRIPOLI

That it may be possible to obtain a plentiful supply of water in the desert country of northern Tripoli is indicated by the success of the Italian government in drilling for artesian water at Zuara, a coast oasis of considerable importance west of Tripoli. There was little or no flow as the drilling progressed until a depth of 787 ft. was reached, when the water gushed forth to a height of 13 ft. above the ground with an initial flow estimated at 1,900 gal. an hour. It is believed that a permanent flow of about 1,340 gal. an hour can be relied on. At present the water from this well contains magnesia, is sandy, and has a bitter taste, but filtration with paper alone is reported to have given practically pure water, and there is little doubt that if it is submitted to regular processes of filtration, water suited to all purposes will be obtained.

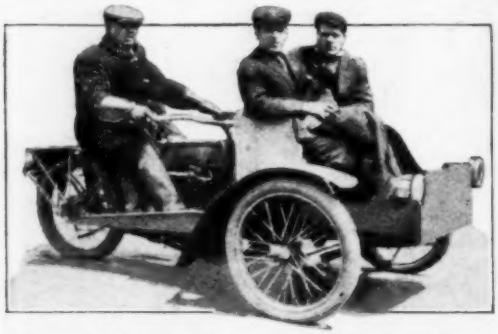
PORTABLE HORSE FEEDER FASTENS TO SHAFTS

Allowing an animal as much freedom as if it were eating in a stable stall, a horse feeder of metal and built box-shaped is attached to the tongue, or shafts, of a wagon when in use. With this device, providing the bridle is removed, a horse may eat just as comfortably while in harness on a busy street as at any other place. An adjustable stand, which folds into compact form when not in use, supports the weight of the wagon tongue when a team is being fed, so that they will be relieved of the burden. The feed box is held rigidly and at a convenient height. The device is also fitted with a double-leaf cover, which fastens tightly over the container when it is being carried filled with grain, and in addition serves to catch any feed dropped by an animal while eating.

¶Conversations by wireless telephone have been held between a moving train in Utah and a station 15 miles distant.

PASSENGER BODY IS USED WITH CYCLE TRUCK

To make a commercial motorcycle do service seven days a week, one owner has devised a passenger body



Passenger Body Attachable to Cycle Delivery Truck

which he substitutes for the package-delivery carrier ordinarily used on the truck. When the machine is to be used for pleasure purposes, the bundle box is removed and the other attached. With this, which is capable of holding two persons, he has carried a load of more than 600 lb. over country roads without difficulty. In a road run, held late in the summer between Chicago and Milwaukee, the man was able to keep up with the pace set by the other drivers, carrying with him at the same time two friends.

ESKIMO HIGH KICKERS USE BOTH FEET

Instead of using only one leg in the standing high kick, the Eskimo, as may be seen by the accompanying photograph, employs both his feet just as he would in a high jump. Although handicapping himself in this way by throwing his head and shoulders higher than his feet, a record of 6 ft. 9 in. has been established, which is high when it is considered what is actually accomplished. Probably no other people more thoroughly enjoy displaying their athletic abilities than do the Eskimos who flock into Nome, Alaska, by the hundreds from the near-by islands whenever there is to be a celebration of some national holiday. On these occasions the natives take a prominent part in the outdoor sports, which correspond to the field-day events of the United States.

PANAMA RADIO TOWERS TO BE SIX HUNDRED FEET TALL

Construction work has been commenced at Panama Canal on the first of the three 600-ft. aerial towers for the Darien wireless station. All the preliminary work has been completed, including the erection of a 150-ft. timber shaft for handling the structural pieces to the 200-ft. level on the first tower. This has been placed in the middle of the area to be spanned by the legs of the aerial, which will be set at the points of an equilateral triangle measuring 150 ft. on the sides. The method of building to be employed after the 200-ft. level is reached has not been decided as yet, but it is considered likely that a gin pole will be employed. Since the material becomes lighter as the tower rises it is possible that, after the 400-ft. level is reached, the steel will be handled with a small derrick, and toward the top with hand ropes. At its apex each tower will be 10 ft. across on each side. A total of 960 tons of steel will be used in the work.

TARGET-PRACTICE RECORD CAUGHT BY CAMERA

An accurate record of the performance of the guns of all the battleships, as shown in target practice, is kept on file at Washington. An important part of these data consists of actual photographs which tell nearly the whole story at a glance. The pictures show the dispersion, the number of shots in the salvos, and the striking place of the projectiles in relation to the target.

The photographs are taken by two electrically operated cameras, each mounted on a vantage point at opposite sides of the after part of the ship which tows the target, so as to insure getting a large scope of horizon into the picture in order not to miss any splash made by a shell, regardless of where it might light. The target is floated 400 yd. astern of the towing ship, and splashes 130 ft. in height at that distance appear plainly in a photograph. Since the films cannot be marked as the pictures are taken, an ingenious method of identification is employed. A large board carrying the name of the firing ship is placed on the deck at the stern of the towing craft. A life buoy marked with the name of the latter vessel is placed beside this, while a signal boy is stationed just behind it to indicate the numerical order of the shots. In this way, as may be seen in the accompanying illustrations, each picture identifies itself. In this case the "Delaware" is shown firing, the "Michigan" towing, and the shots being fired are the eighth broadside in the series of pictures taken, since the signal boy is forming the letter "H" with his flags.

A Salvo Fired from the "Delaware" and Recorded by the Cameras

On the Stern of the "Michigan," Showing System of Identifying Photographs

One of the Electrically Operated Cameras

NEW PROCESS FOR MAKING FUEL BRIQUETTES

A new process for making coal dust, lignite, peat, or sawdust into briquettes suitable for use as a fuel is now being introduced in France. This process consists in mixing with the material treated some gelatinous substance such as the flour made from rice, compressing the mixture into briquettes, and drying under a high temperature. In making briquettes from anthracite-coal dust, a mixture is made consisting of 2½ per cent of rice flour and 97½ per cent of coal dust. Hot water or steam is then injected into the mixture to transform the flour into a pasty mass, and the whole is thoroughly kneaded before it is passed to the fuel press. After being taken from the press, the briquettes are dried for three or four hours in a temperature of from 180 to 360° F. It is said that the briquettes made by this process are capable of withstanding the action of water for a long period without danger of disintegration.

¶In a cruise over Berlin recently the new army Zeppelin "V" made an almost noiseless flight.

"LITTLE LANDERS" ATTEMPT TO SOLVE PROBLEM OF LIVING WITHOUT WORRY

Interesting Agricultural Community Where No One Is Rich but Everyone Is Happy

"A LITTLE land and a living surely is better than desperate struggle and wealth possibly" is the motto of a colony of 500 persons, known in Southern California as the "Little Landers," who form a coöperative agricultural community at San Ysidro, a short distance from San Diego. The settlement is made up of families whose landholdings represent only what their members are capable of cultivating thoroughly and easily without employing help.

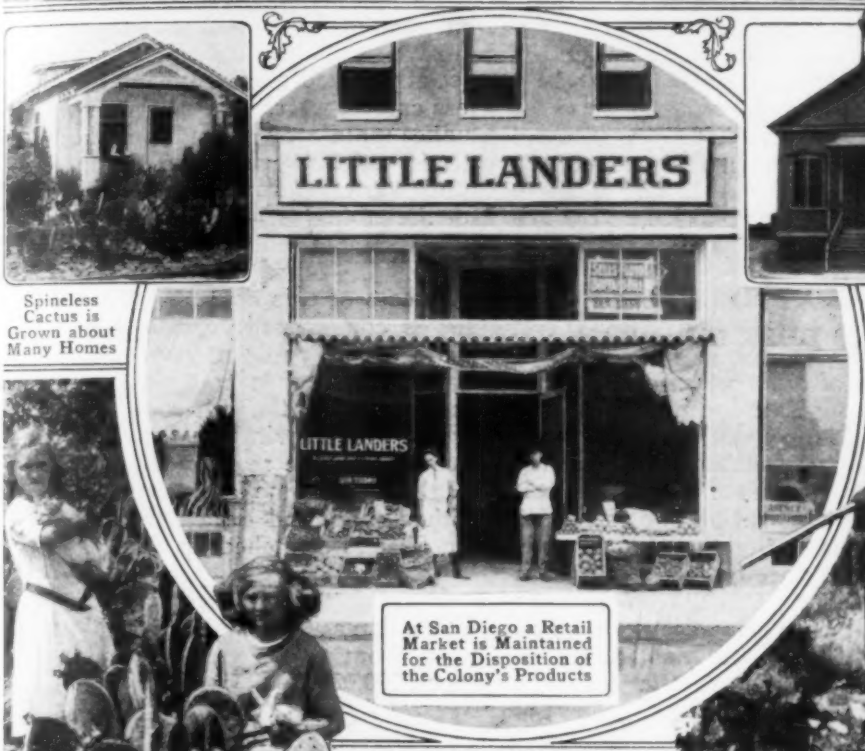
A bringing together of social and intellectual advantages with husbandry is the principal idea back of the organization. Each person has an equal voice in the affairs of the colony, the business management of which is in the hands of a board of directors whose recommendations are voted upon and disposed of at town meetings. Intensive cultivation of the land in conjunction with coöperative buying and marketing makes it possible for the people to derive a comfortable living from plots of ground which average two acres in size, the smallest piece being a quarter of an acre, and the largest seven acres. In joining the colony, the deed to an individual's land provides for its forfeiture if it is ever rented to Asiatics, Mexicans, or undesirables, or if its owner ever sells intoxicating liquors. The commissions from the sales of property form a public fund which is used for community development, such as the building of roads, planting of trees, or upkeep of public works. The community has its own institutions, possesses a park, and looks to the moral and educational advancement of its members. A clubhouse shelters a small library and also serves as a meeting place where classes in science, agriculture, and the Bible are held for the adults. The education of the children to a certain point is provided for by a community school.

All the supplies needed by the various families, which have gathered there from every part of the United States, are kept at a general store and portioned out as they are required. On the other hand the marketable products, which consist of vegetables, fruits, poultry, and similar produce, are collected daily from each producer and taken to San Diego where the colony operates its own retail market.

Left: Overhead Irrigation Pipes Make a Scarcity of Rain Unfeared
Right: In Winter Strawberries and Vegetables are Grown under Canvas

Spineless Cactus is Grown about Many Homes

The Children are Provided a Good School



At San Diego a Retail Market is Maintained for the Disposition of the Colony's Products

Left: A Cactus Plot One Year after Planting
Right: Kale is Particularly Adapted to This Climate and Often Grows to a Height of Six Feet

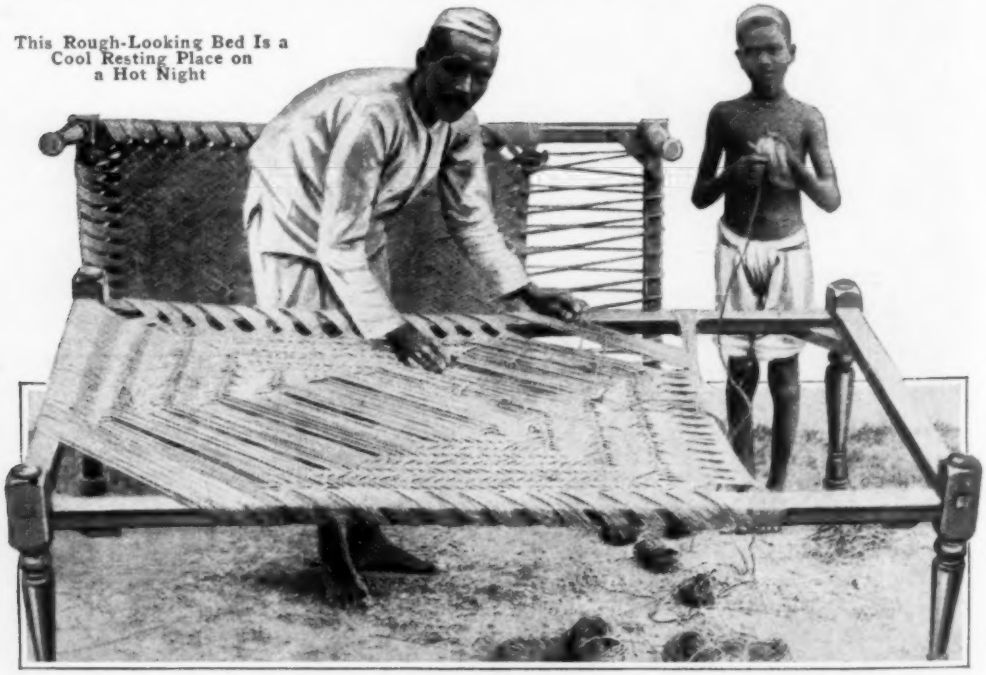
Every Inch of Ground around the Homes of the "Little Landers" is Made to Produce Something Almost the Year Around. No One Is Idle, nor Is Anyone Ever Overworked

The town of gardens is situated in a locality where the climate makes it possible to till the ground the year around, while the lack of rain does not mean a crop failure, for the land is irrigated. A pumping works owned by the community raises water from an underground river into reservoirs from which it is used as needed. Ideally cared for in this manner, many of the vegetables show remarkable growth at times, there rarely being a frost. Tomato and lima-bean vines planted a year ago are now in some instances 10 ft. in height, while lettuce leaves from 10 to 15 in. in length are not uncommon, and kale stands 6 ft. high. Large profits accumulate from poultry. Ducks, rabbits, and goats constitute other sources of revenue. The dry atmosphere is especially suited for the raising of spineless cactus, which requires little water, makes rapid growth, and furnishes fodder for chickens, replacing alfalfa. Another variety forms a nourishing food for the table.

INDIAN MATTING WEAVERS MAKE BEDS OF FIBER

Mattings of different kinds are widely used throughout India as floor coverings and in the construction of furniture, and the sight of a native weaver at work is not uncommon. The accompanying illustration shows one of these artisans lacing the fiber strands in the manufacture of a typical Indian bed. The cordage is woven over an ordinary framework diagonally and forms a lasting, substantial bottom, in principle the same as the ordinary wire cots of this country. The weaving is commenced from a crosspiece made of the cords at one end of the frame, the strands being carried from one corner to the other on the bias. When the weaving is completed, the free end of the matting and one end of the bed frame are laced together with a rope, and drawn tight so that the fiber is stretched up firmly.

¶The damage to highway bridges in Iowa from floods early in 1914 was over $200,000.



This Rough-Looking Bed Is a Cool Resting Place on a Hot Night

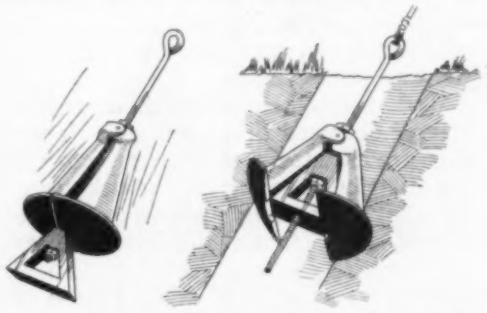
Street Cars Carrying Posters Like This, Run through the Streets of Boston, Marked the Inauguration of an Aggressive Safety-First Campaign in That City

HOW BOSTON PUSHES ITS SAFETY-FIRST CAMPAIGN

Street cars carrying posters that entirely covered each side of the car were run through the streets of Boston recently, marking the inauguration of an aggressive safety-first campaign in that city. In the few weeks that this campaign has been in progress, it is said to have brought about a remarkable decrease in the number of accidents, not only in the streets but in shops and commercial establishments as well. The work being done by the street-car companies, important as it is, is only a part of the campaign. Every part of the city is placarded with signs and posters, while the chamber of commerce, by the distribution of circulars containing safety-first rules and suggestions, is continually hammering home the necessity for watchfulness and caution. One expression that appears on many of the posters and seems to have become a popular slogan is, "Better be Safe than Sorry."

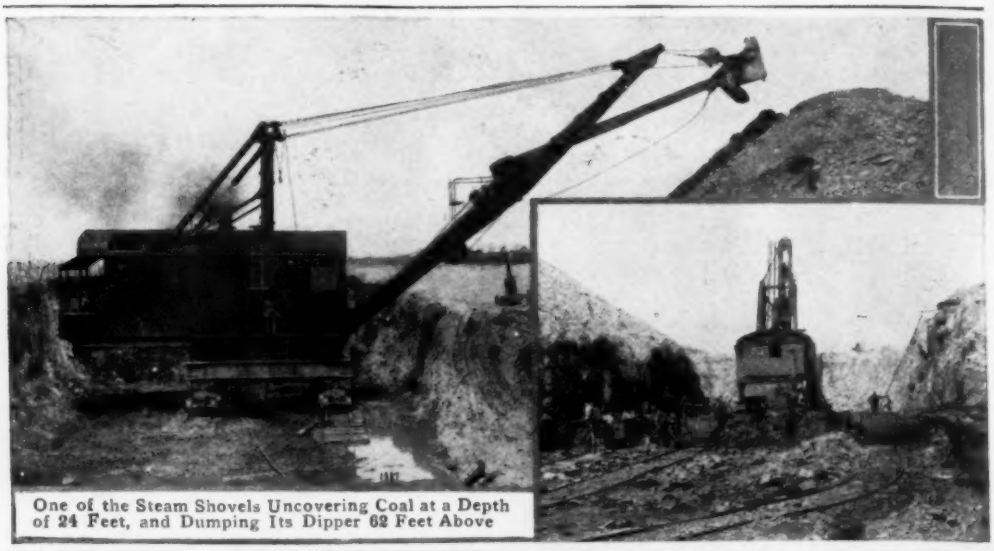
GUY ANCHOR HAS POSITIVE EXPANDING DEVICE

An expanding guy anchor, recently patented, has a V-shaped section or wedge which is drawn up by a screw-thread between two flanged jaws, forcing them apart and into the firm earth around the hole. The use of this anchor involves the excavation of a circular hole to such depth as may be



When the Threaded Shaft is Turned, the Wedge Forces the Anchor Parts into the Adjacent Ground

necessary, but once adjusted it will resist almost any direct pulling strain that may be brought to bear on it.



One of the Steam Shovels Uncovering Coal at a Depth of 24 Feet, and Dumping Its Dipper 62 Feet Above

At the Right: Nearing the End of a Long Cut. When the Edge of the Vein is Reached the Direction of Operation is Reversed and the Earth from the New Cut Used to Fill the Old Excavation

STEAM SHOVEL BECOMING FACTOR IN COAL MINING

Coal stripping, accomplished through the employment of giant steam shovels, is rapidly taking an important place in the mining industry of southeastern Kansas. A rich stratum of bituminous coal lying between 10 ft. and 30 ft. below the soil surface, for years has been almost valueless because of the tremendous expense necessary to grade down to it with teams. It lacked a shale roof to support the earth upon its removal, so the very fact of its close proximity to the top of the ground placed it practically out of reach, for under the circumstances tunnel mining was not feasible.

Modern engineering methods recently have changed this condition. There now are 26 steam shovels at work in the district clawing the earth away and daily exposing approximately an acre of coal. And while it was necessary for the pioneer operators to sink their shafts through this stratum to lower veins, today the process is being reversed until steam shovels are producing one-sixth of the coal of the region.

The great machines, some of which dig excavations 100 ft. wide and 24 ft. in depth while passing once over the double tracks supporting them, quickly cut from the surface of the ground to the stratum of coal, which varies in thickness from 18 in. to 4 ft. This is then easily blasted, and loaded into cars by other power shovels. As the great machine digs its way along, the overburden is cast upon the banks of the excavation. When the edge of the vein is reached the shovel is turned around and started back, digging another cut and filling the old one alongside with the dirt originally taken from it. After a shovel has passed through a large area the land bears the appearance of having been worked by a huge plow. It is the belief of authorities that much of this land in the future may prove valuable for orchard or alfalfa raising.

SKELETON OF GIANT WHALE IN NEW ZEALAND MUSEUM

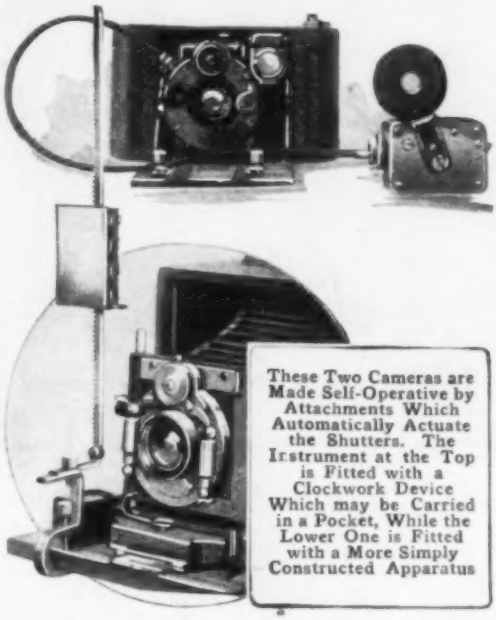
In the museum at Christchurch, New Zealand, there is a skeleton of a whale which measures 87 ft. in length. The bones alone weigh approximately nine tons. This is the frame of what probably was the largest living animal

ever seen by a human being. The whale was washed on the beach at Okarito, Westland, and was immediately taken in charge by the authorities of the museum. The gigantic size of the animal may be appreciated when it is remembered that the average length of a whale is between 30 and 50 feet.

CAMERA ATTACHMENTS BRING OPERATOR INTO PICTURE

Automatic shutter trips for use on cameras, to make them self-operative and enable a photographer to include himself in a picture, are attachments which have been developed lately for the amateur. One of these, built compactly so that it may be carried in a pocket or handbag, is attached to a common type of plunger which actuates the shutter. In setting the trip, a flaglike lever is pulled back and then released, its mechanism consisting of clockwork which draws it back to its original position in 15 seconds, snapping the shutter. After the lever is set, the operator is given adequate time to walk in front of the lens before the exposure is made.

Another arrangement which accomplishes the same thing, is composed of a geared bar which is clamped in an upright position close to the shutter lever. A box-shaped case containing gears moves slowly down the vertical piece and a protruding finger trips the shutter as it passes.

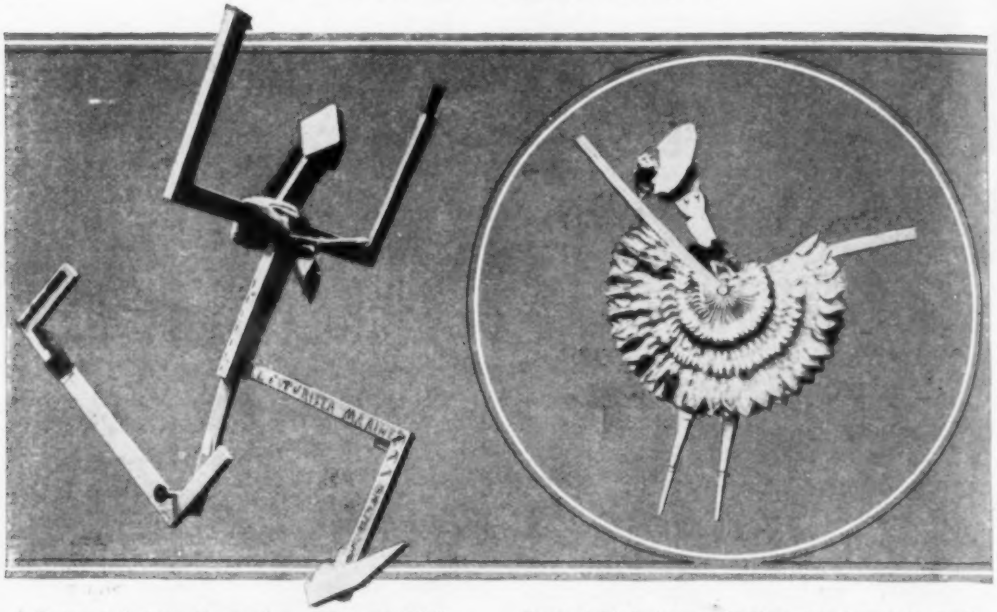


These Two Cameras are Made Self-Operative by Attachments Which Automatically Actuate the Shutters. The Instrument at the Top is Fitted with a Clockwork Device Which may be Carried in a Pocket, While the Lower One is Fitted with a More Simply Constructed Apparatus

LIGHT STRUCTURAL BEAM SUPPORTS HEAVY WEIGHT

In constructing a girder to be used in aeroplane construction, where both lightness and strength were essential factors, a beam 22 ft. in length, weighing only 14½ lb. and capable of sustaining the weight of three men, was recently made of wood. It measures 6 by 6 in. in cross section at its point of greatest circumference, and tapers to a thickness of 2½ in. at one end. The member is of the latticework type of construction, and under test, showed but slight deflection.

Extremely Light Beam Supporting the Weight of Three Men

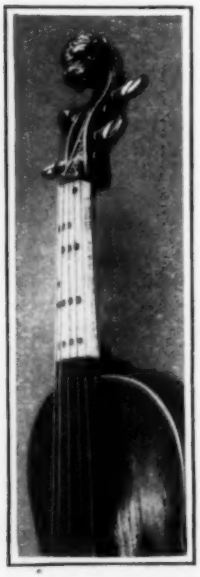


A Futurist Artist's Conception of Himself While Working at High Speed

Portrait Made from Odd Materials Found in Studio When Subject was Conceived

VIOLIN PUPIL IS ASSISTED BY INVENTION

As an aid in familiarizing a pupil with a violin a European master has conceived a method of indicating the exact positions for the fingers. This has been accomplished by stamping a strip of paper with dots and fastening it to the finger board of the instrument so that a beginner is shown where the strings should be pressed in order to produce pure tones. It is pointed out that a novice in this way begins right and soon acquires the habit of holding his fingers in the correct position, striking his notes without difficulty. The arrangement is asserted to be a help to the teacher and also assists a person in practicing without the assistance of an instructor.



FUTURIST MAKES PORTRAIT OF OWN VIRTUES

To the person who has posed for a futurist painter or sculptor and then suffered a stinging pang of disappointment upon finding a wide variance between the artist's conception of his subject and his own, it would no doubt be gratifying to know that the futurist's portraiture of his own virtues is no less unbecoming than of others. An accompanying illustration shows a portrait of one of the leading futurists, done by himself in an attempt to interpret "plastic dynamics," or his conception of himself while working at great speed. The statue is composed of various objects caught at random from about the studio, and to the unappreciative undoubtedly looks not unlike a kindling pile trying to escape an axman. The head is made of a scrub brush and other equally unhandsome materials fastened together. One knee is graced with a spool that once served for a photographic film, while the other has no joint at all.

A second piece of work, which is entitled "Mademoiselle Flicflic Chapchap," and intended to represent either a ballet dancer or a peacock, was made

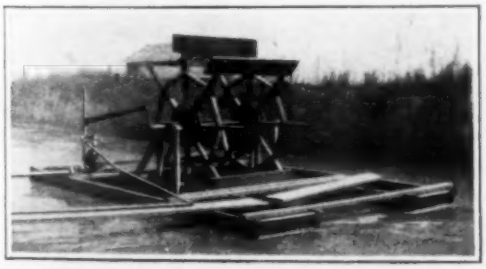
in a similar manner with a paper fan, a half-burned cigarette, two cigarette holders, a piece of lace, and a few other odds and ends. These works were seriously produced in the name of art and shown in an exhibition in London.

LEAD FROM RADIOACTIVE SUBSTANCES

Recent investigations indicate that the atomic weight of lead extracted from radioactive substances is less than that of ordinary lead. The reason for this curious phenomenon is not known, but one of the theories that has been advanced is that the atom of lead derived from this source is in fact a combination of two substances, one of which is an element lighter than lead and possibly a new chemical element.

CURRENT SUPPLIES POWER FOR PUMPING

A simple and ingenious pumping apparatus installed in an irrigation canal in California uses the force of the current as power for pumping and automatically adjusts itself to changes in water level. This apparatus consists simply of a large paddle wheel which operates a force pump, both being carried on floats anchored in the middle of the canal. From the pump a flexible pipe, to allow for variations in water



This Water Wheel, Moored in an Irrigation Canal Uses the Force of the Current for Pumping Water into a Reservoir 15 Feet Above

level, leads to a reservoir 15 ft. above. The water wheel is 8 ft. in diameter and is capable of pumping 500 gal. in 12 hours

TEA FOR CIVILIZED TABLES CARRIED MILES OVERLAND

Probably few realize the stories of hardship and poverty told by the twisted leaves which occasionally set-

Tea Bound for the American Breakfast Table from the Interior of China

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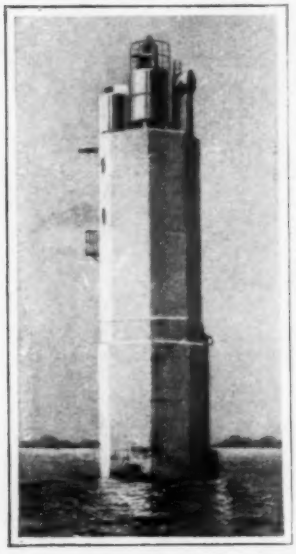
tle to the bottom of their cups of breakfast tea. In China man is the common beast of burden in many districts and often whole families derive their support from the meager earnings made by packing large bundles of tea across the mountains to shipping points where it is relayed to civilized countries. The accompanying picture shows a father and his nine-year-old son starting out on a 400-mile journey in severe weather, barelegged and barearmed. The man carries a load of 350 lb., while the boy holds bundles weighing about 80 lb. The little fellow is supposed to brave the same hardships as are withstood by the father and travel at the same gait. His only concession is that he carries a lighter load. Wretched roads are encountered in many places in the mountains.

UNATTENDED LIGHTHOUSE OFF GUERNSEY ISLAND

Standing alone on a wave-dashed rock at the entrance to Russell Channel of Guernsey Island, off the coast of France, is an unattended lighthouse which marks the way to St. Peter-port and warns approaching vessels of danger. The operation of the signals is controlled from shore by electricity, the lonely sentinel being connected to the mainland by a submerged cable. The tower is of octagonal shape, is built of reinforced concrete, and extends to a height of 80 ft. It is of solid construction to a height of 46 ft., while on upper levels it carries electric motors and air compressors which actuate the lights and foghorn. Massive steel beams are imbedded in the rocks on the side of the structure which is exposed to the heaviest seas. On the top of the shaft is an acetylene-gas plant which operates automatically. It is only at low tide that the rock can be seen at all, while approach to the lighthouse is made dangerous by strong currents.



PLAN TO DROP REAL BOMBS FROM NEW AIR CRAFT

For the aerial corps of the United States Army stationed at San Diego, Cal., a new four-passenger military biplane has been built from which it is planned to make bomb-dropping tests with actual explosives instead of dummy destroyers. The machine is fitted with a recently patented bomb-throwing apparatus and is expected to illustrate concretely what effect an air craft would have in time of war in attacking a fortress or battleship. The biplane is reputed to surpass any previous craft made for the government. It is supplied with a 100-hp. motor and is able to make a speed of from 70 to 80 miles an hour. A long aluminum hood, carrying the engine cylinders and radiator, forms the nose of the craft, while the rest of the car, joining in with this, gives it similarity to an automobile body. Provision is made for carrying only 20 gal. of gasoline, so the flight of the biplane is limited to between four and five hours, approximately.

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Latest Addition to Aerial Equipment of Army Which may be Used in Actual Bomb-Dropping Tests

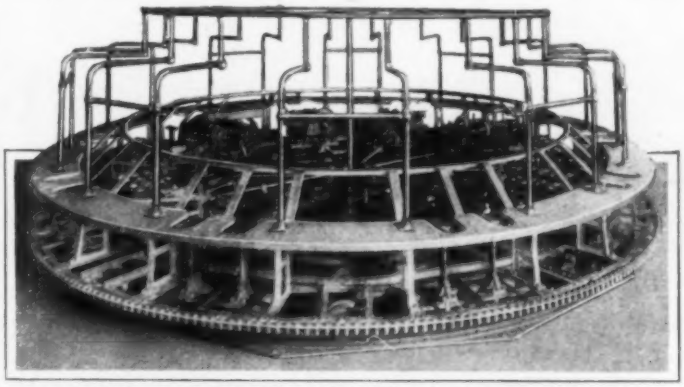
Rotary Kiln, One of Largest Pieces of Freight Ever Shipped across the Continent

FOUR FLAT CARS ARE USED TO SHIP LARGE TUBE

A rotary kiln, 120 ft. long and 149,900 lb. in weight, constituting one of the largest single pieces of freight ever shipped across the continent, was recently received from a Pennsylvania steelworks at a California cement plant where it was installed for manufacturing purposes. The outside diameter of the tube is 12 ft., which is large enough to allow the passage of an ordinary-size motor truck through it. It was loaded on four flat cars, and rested at each end on swivels so as to allow it to negotiate the curves encountered on the railroad. Thousands of persons inspected the kiln during its journey across the several states, and when it arrived at its destination, it bore many names written on its interior walls.

INGENIOUS MACHINE FOR SHINING SHOES

An ingenious machine that performs all the operations required in shining shoes, from the first cleaning to the final cloth polishing, and is capable of doing this at the rate of 300 pairs of shoes an hour, is one of the latest additions to labor-saving devices. With this machine, which weighs two tons and is 16 ft. in diameter, it requires two minutes for a shine from start to finish, and during this time the shoes are worked on by 150 brushes. These brushes are geared to rotate rapidly on vertical shafts and form parts of "batteries," each of which moves out from the middle of the machine, does its work on one pair of shoes, and then moves back out of the way and in readiness for the next pair. The brushes are controlled by springs so that they bear against the shoe with just the right pressure to work every part of the surface and to adjust themselves to shoes of different sizes, but not so powerfully as to cause any discomfort. In getting a shine, all that is necessary is to mount the revolving platform, place the feet on foot rests, and stand still while the



To Get a Shine with This Machine, All That is Necessary is to Step on Foot Rests on the Revolving Platform and Stand Still While the Platform Makes One Revolution

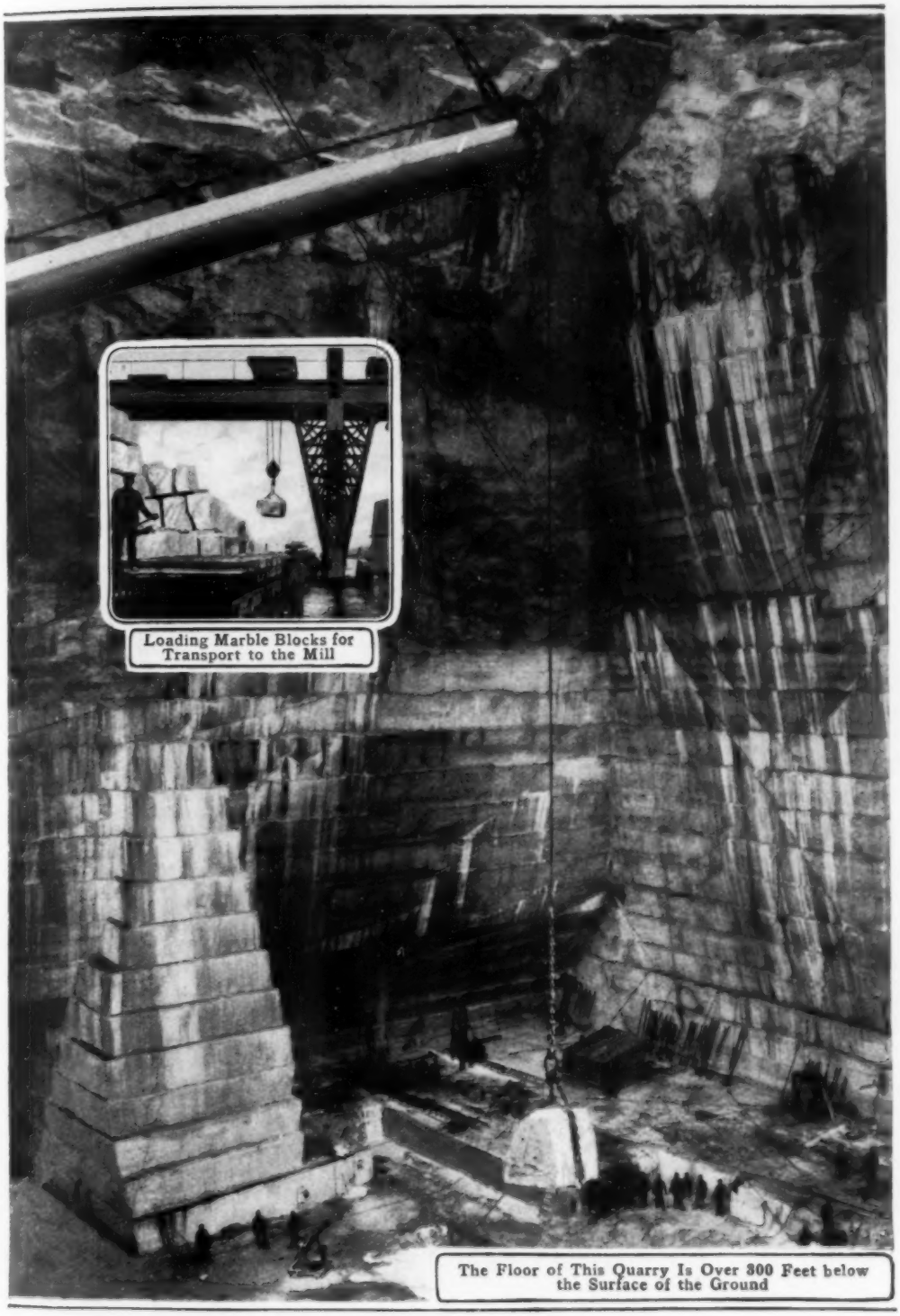
platform makes one revolution, there being no change of position required while the work is being done. The platform makes one revolution in two minutes and has spaces for 10 customers. The machine consists of eight "batteries," each of which does one particular part of the work of cleaning, daubing, and polishing. The last "battery" in the process is the cloth polisher, which does its work with all the deftness of the professional bootblack.

IN THE MARBLE QUARRIES OF VERMONT

The greatest marble-producing industry in the world is no longer to be found in the famous Carrara district of Italy, but in Vermont, where one of the richest veins in the world stretches in an irregular line across the state. So great is the production of marble in this section that the inhabitants have lost much of their appreciation of its value, and use it for such humble and utilitarian purposes as paving, underpinning for barns, hitching posts, stepping stones, and drinking troughs for horses. This vein is about 57 miles long, from 1,650 to 2,200 ft. in width, and runs from 375 to 850 ft. in depth, and from it is being taken in enormous quantities white marble that is equal to the finest Italian marble, as well as an endless variety of blue, yellow, green, and jet-black marbles.

For quarrying and finishing the marble, the most up-to-date methods and equipment are used, no part of the work being done by hand that can possibly be done by machinery. Hand methods of drilling, still in vogue in Italy, have been entirely superseded by power-driven drills and channeling machines. The blocks, as they come from the quarry, are handled by derricks and are conveyed in most cases by an inclined railway or a ropeway to the mills, where they are sawed and shaped by power-driven machines, only the last, delicate stage of polishing being done by hand. Blasting is resorted to in removing the decomposed rock overlying the vein, but no blasting, on account of the danger of shattering the marble, is ever done in the actual work of quarrying. The first work is done by the channeling machine, which makes a series of cuts about 6 ft. deep along and across the bed, to divide the marble into uniform blocks of a size and shape to be handled by the derricks. The next step is to break out and remove the "keystone." This gives access to the bottoms of the adjacent blocks, and the remainder of the process is comparatively simple. Drills driven by steam or compressed air are then used for drilling holes crosswise through the base of each block so that it can be wedged and broken from the bed easily. This process is called "gadding," and is repeated until all the blocks are removed and it is necessary to set the channeling machine to work again. In some of the quarries the marble has been taken out to a depth of over 300 feet.

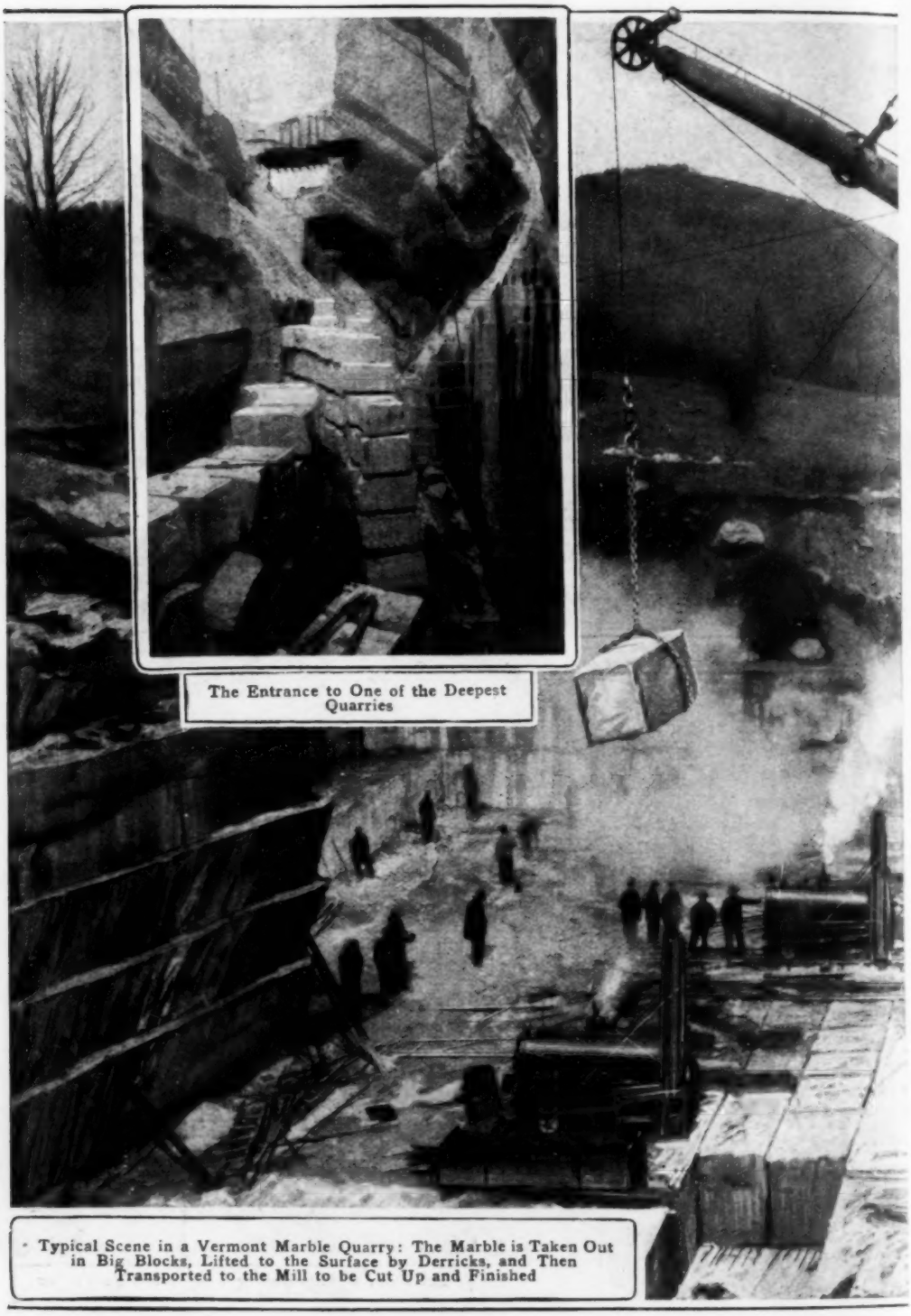
In the mill, the blocks are first cut into slabs of the required size and shape by gang saws, which are simply strips of steel carried on a steel frame. As the frame is swung back and forth across the face of the block, a series of cuts is made through the block by the steel strips, sand and water being fed constantly into the cuts to increase the friction. The marble can then be used for many purposes, but if it is to be finished, it is next sent to the rubbing beds where the saw marks and other irregularities are removed. The marble is then ready for the polishing, and this must be done in much the same fashion as it was done by the ancients, as no machine has yet been made that will take the place of the highly skilled labor required for this work. The surface of the marble is rubbed down by hand until it is as smooth as glass, and the final gloss is put on by means of putty and acid.



Loading Marble Blocks for Transport to the Mill

The Floor of This Quarry Is Over 300 Feet below the Surface of the Ground

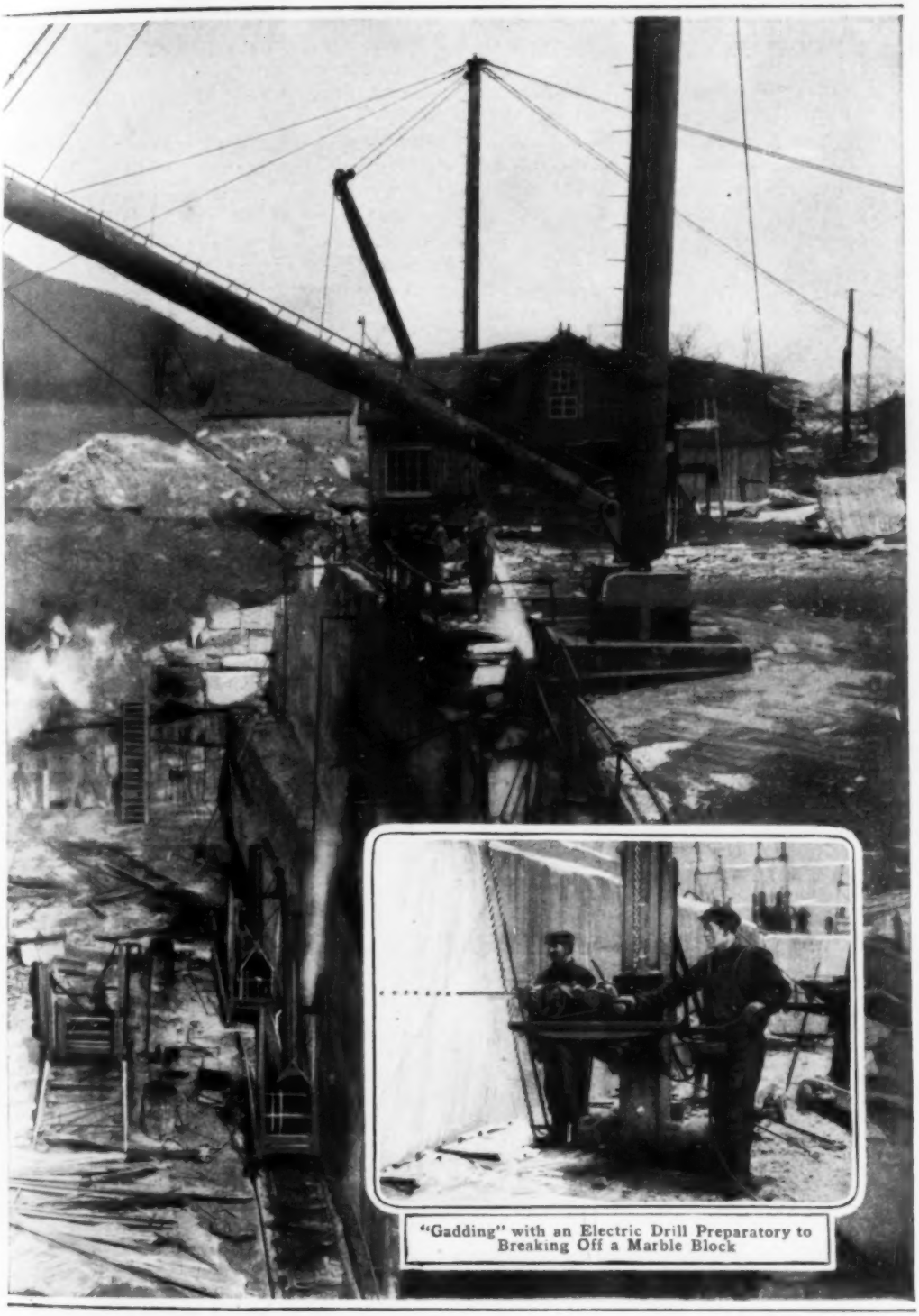
IN THE MARBLE QUARRIES OF VERMONT



The Entrance to One of the Deepest Quarries

Typical Scene in a Vermont Marble Quarry: The Marble is Taken Out in Big Blocks, Lifted to the Surface by Derricks, and Then Transported to the Mill to be Cut Up and Finished

IN THE MARBLE QUARRIES OF VERMONT

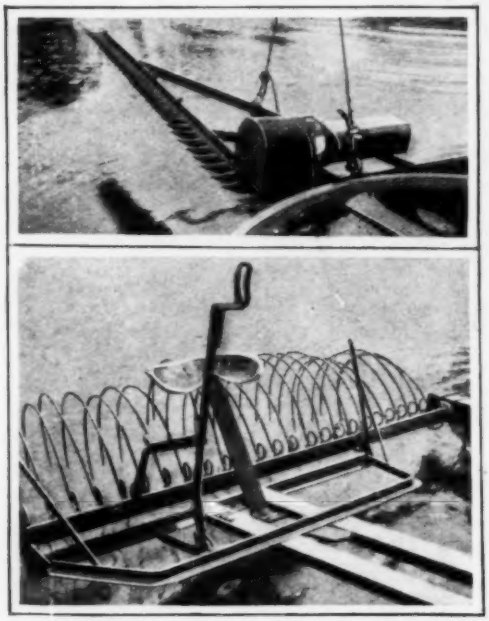


"Gadding" with an Electric Drill Preparatory to Breaking Off a Marble Block

IN THE MARBLE QUARRIES OF VERMONT

WATER MOWER CUTS WEEDS FROM RIVER BOTTOM

In order to keep the San Marcos River of Texas unobstructed by various forms of vegetation with which it



Water Lawn Mower Which Clears San Marcos River of Vegetation

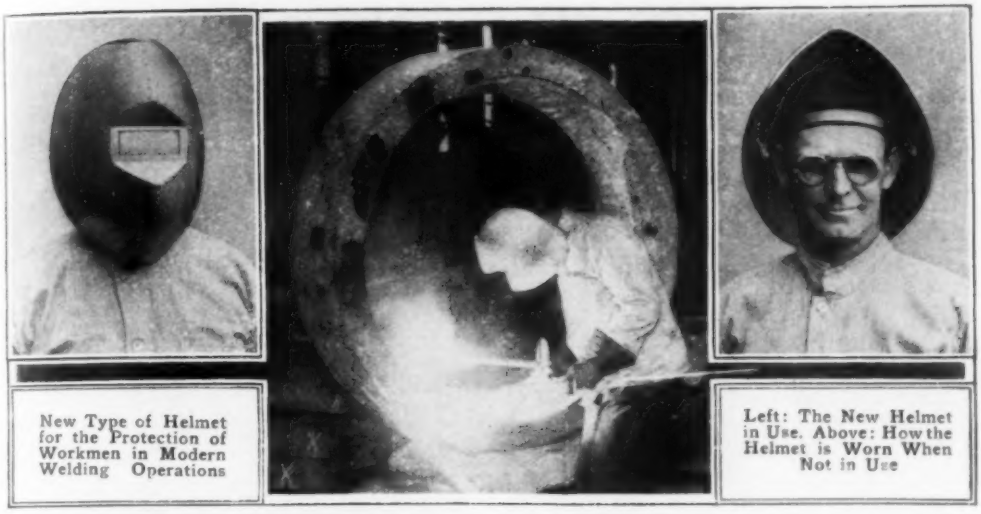
abounds, a utility company which operates a hydroelectric plant on the stream patrols its channel with a river lawn mower. The boat, which is built not unlike a flat-bottomed barge, is supplied with a long cutting bar similar to those employed on mowing machines. This cuts through the heavy mass of seaweed as rapidly as it is encountered, while a hayrake back of it collects the product as it is forced to the surface. In this manner the mower is kept busy constantly cutting away the growth which otherwise would so impede the current of the river as to make the operation of the power plant almost impossible.

MERCURY LIGHTS ARE USED FOR INSPECTING SUGAR

Mercury-vapor lights are making inspections of cube sugar and ivory possible during cloudy weather or at night. Impurities in white sugar manifest themselves by giving the product a yellowish hue. In certain lights this is not noticeable, and for that reason the common practice is to make the inspections under sunlight. The bluish-green light of the mercury lamp, however, causes the yellow color to stand out so that it is readily noticed. To detect impurities, plates of sugar, an inch in thickness, are held before a mercury lamp. The same light allows the sorting of the different shades of ivory, making it unnecessary to limit the grading to the daylight hours.

AN AMERICAN GOVERNMENT-OWNED RAILROAD

Type of Passenger Equipment in Use on the Railroad Built and Operated by the United States Government in Idaho: This railroad, which is 22 miles long, is employed in transporting passengers and freight between Barberton and the great irrigation dam under construction across the Boise Canon at Arrowrock. It is operated by the Reclamation Service, as indicated by the initials "U. S. R. S." on the locomotive tender.



New Type of Helmet for the Protection of Workmen in Modern Welding Operations

Left: The New Helmet in Use. Above: How the Helmet is Worn When Not in Use

HELMET PROTECTS WELDER FROM GASES AND HEAT

Affording a workman protection against pungent gases and intense heat and light encountered in electric-arc and autogenous-welding processes, an aluminum helmet which may be turned back on the head like a hat when not in use is being made. It is designed so that an operator may also wear safety goggles to safeguard his eyes when it is necessary for him to have an absolutely unobstructed view of his work. The outline of the headgear is not unlike that worn by the medieval knight, it being formed of two curved plates riveted down the middle. This offers a convex surface which to some extent deflects heat rays. A rectangular aperture in front of the eyes is fitted with a triple-glass shield which gives a reddish-purple light suitable for welding work, and also protects the operator from incandescent particles of metal thrown off in cutting operations. A band encircling the head and holding brackets which pivot to the helmet gives it its support. The weight is 28 ounces.

¶By means of a device known as a heat exchanger the heat contained in slag thrown off in making pig iron is now used for making steam to drive low-pressure turbines.

ANARCHISTS' FUNERAL URN OF CURIOUS DESIGN

A striking and gruesome example of the influence of the cubist movement in art is seen in the funeral urn designed by a New York sculptor to be the last resting place of the ashes of the three anarchists who were killed by the explosion of a bomb which wrecked a Harlem tenement house. The crude, angular lines of the clenched fist surmounting a rugged

Cubist Funeral Urn to Hold the Ashes of Anarchists

pyramid are intended to typify the uncompromising hatred of the anarchists for human laws and the existing social order.

SANDALS OF ROMANS FOUND UNDER LONDON STREETS

Leather, still in a fair state of preservation although in some cases 2,000 years old, is to be seen at the British Museum in sandals and early shoes which have been found about London during the course of excavating. Many of these are remnants of early Roman days on the isles, when, for approximately 400 years following the opening of the Christian era, Britain was occupied and ruled by the Romans. Since several of the principal streets of London were laid out at that time by the conquerors, these shoes may once have trodden some still existing thoroughfares of the city. Besides the sandals, Saxon shoes which resemble in striking respects those worn today in the Shetland Islands were found in

A Saxon Shoe Resembling the Type Now Worn in Shetland Islands

A Group of Shoes Dug from Beneath the Streets of London: Left, Example of Pointed Footwear of Fifteenth Century; Right, Roman Sandals Found in the Moorgate-Street District

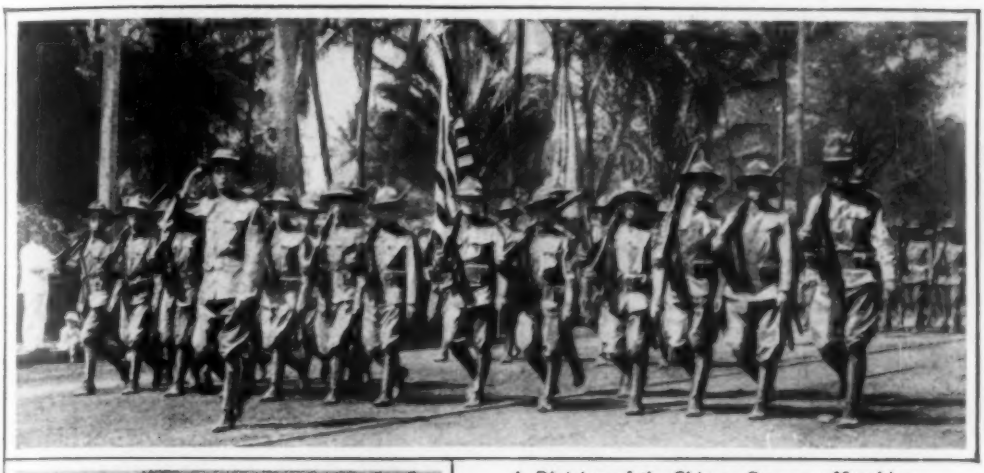
Specimens of Early Footgear Each of Which was Made from a Single Piece of Leather and Sewed along the Edge of Sole

the Moorgate-Street district and London Wall. Many of the shoes of the fifteenth century also have been collected, and in a great number of cases these are made with a single sole, the entire shoe often being cut from a single piece of leather and sewed along one edge.

PLACE IN MILITIA GIVEN CHINESE SOLDIERS

A company of Chinese soldiers regularly enlisted in the militia in Hawaii constitutes an odd body in the reserve fighting forces of the United States. The organization was formed with the sanction of the War Department at Washington, and under the tutelage of American army officers, has made such pronounced progress in the mastery of military tactics that the recruiting of a second company is being considered. The aggregation of husky Chinese decked in American military uniforms and equipped with the fighting tools of the regular army seems fantastic at first sight. This feeling is removed to a degree, however, when these soldiers are seen saluting the flag apparently with the same zeal and patriotism as is displayed by the native-born soldier. In a recent military tournament in which the company took part, the work of the Orientals caused much surprise and attracted marked attention. A team of eight men picked from its ranks defeated the stars of all the older companies in tent pitching. In wall

A Medieval Shoe Which Resembles Many Modern Slippers



A Division of the Chinese Company Marching under the American Flag

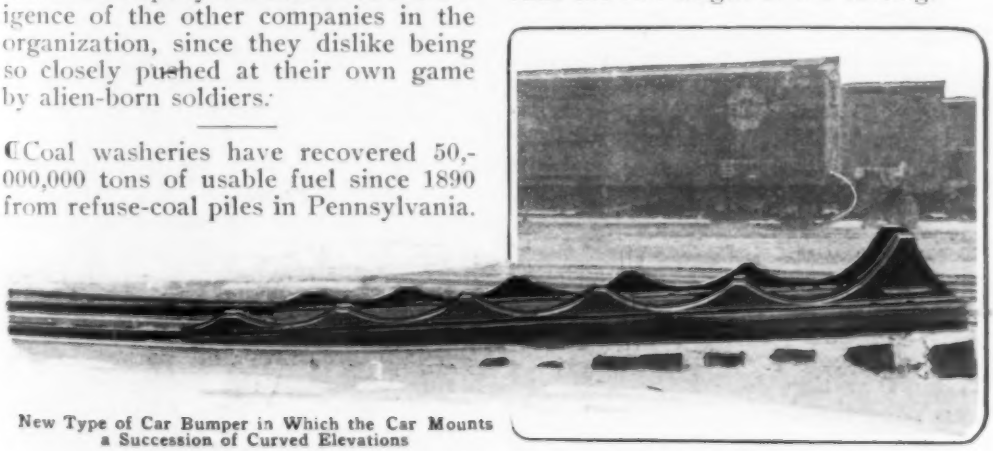
Chinese Soldiers being Coached Regarding the Mechanism of the American Rifle

scaling, the Chinese showed themselves especially well trained, as was true to an extent in signal drills and manual of arms. One of the best shots in the National Guard of Hawaii is a full-blooded Chinese, who is expected to take part in the next tournament at Camp Perry. The recruiting of the Chinese company has increased the diligence of the other companies in the organization, since they dislike being so closely pushed at their own game by alien-born soldiers.

¶Coal washeries have recovered 50,000,000 tons of usable fuel since 1890 from refuse-coal piles in Pennsylvania.

NEW BUMPER THAT STOPS CAR GRADUALLY

A new type of car bumper that is now being introduced is designed to stop a car gradually instead of subjecting it to the strain caused by striking an unyielding bumper of the ordinary type. This bumper is from 30 to 50 ft. long and is made in two pieces, one for each of the rails. It consists of a casting having a succession of curved elevations which the wheels pass over. These increase gradually in height to the last elevation, which is high enough to serve as a positive stop in case the car reaches the end. To prevent derailment a flange way for the car wheels runs the full length of the casting.



New Type of Car Bumper in Which the Car Mounts a Succession of Curved Elevations

CAR BREAKS OVER RAILING IN DASH FOR AREAWAY

An electric automobile dashed across a sidewalk in Rockford, Ill., pushed aside an iron railing guarding

Peculiar Accident from Which Driver Escaped without Injury

an areaway in front of a building, and then plunged headlong into a basement window. The car's occupant, a woman, was pinned between the stone window ledge and the seat of the machine, while her head was immovable between an electric-light bracket and another part of the car, but not a bone was broken. Before the woman could be removed it was necessary to lift the machine partly out of the hole.

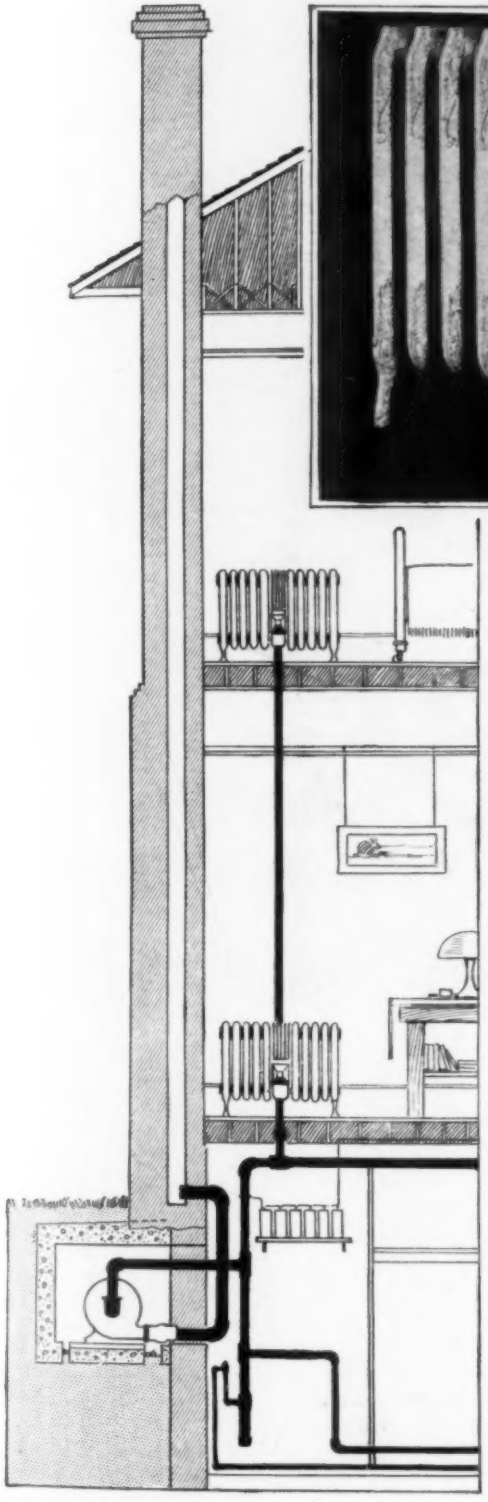
¶Half a million dollars has been appropriated for the U. S. Government's Panama-Pacific Exposition exhibit.

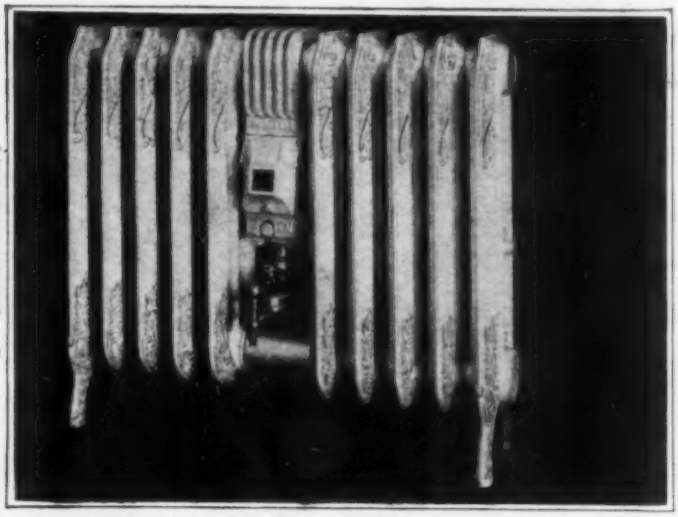
RAY-FILTERING SPECTACLES FOR DAYLIGHT EFFECT

Daylight glasses, or spectacles which when used under artificial light will permit the entrance to the eye of only a daylight spectrum, excluding all other rays, are a possibility of the near future. Experiments are now being conducted along this line and since, through the use of filtering screens, light equivalent to sunlight has already been produced, physicists consider the daylight glass as entirely feasible. Its uses would be manifold, particularly in a commercial sense. In color printing, artificial-teeth manufacture, the selection of diamonds, matching of fabrics, and similar things, the perception of colors as they appear in daylight is absolutely essential. Glasses of this nature would thus allow many institutions to operate on dark or cloudy days without interruption, a thing now impossible. Such an invention would allow a person, visiting an art gallery at night, to obtain the same effects as if he were viewing the paintings under the most favorable circumstances. Light filters are usually made of glass covered with dyed-gelatin films. It is thought that a modification of this will be found satisfactory for use in glasses.

GAS-HEATING SYSTEM THAT NEEDS NO FURNACE

A new gas-heating system for houses is designed not only to produce practically complete combustion of gas, but to discharge the products of combustion through an exhaust pipe into the outer air after the heat has been extracted. Each individual radiator in the system is operated as a unit, but all the radiators are connected to one exhaust pipe through which the gases are drawn by an exhaust fan. The gas enters through an inlet valve, which automatically adjusts itself for variations in pressure, and passes to the burner shown at the middle of the radiator, where it burns in a partial vacuum, just enough air being sucked





In This Gas-Radiator Heating System the Gas is Burned in the Combustion Chamber at the Center, the Products of Combustion Then Passing through the Coils and Out of the Building through an Exhaust Pipe

in through the burner to insure complete combustion. This method of combustion is said to result in the hottest gas flame known. The gases produced by combustion then pass through the coils of the radiator. During this process most of the heat is radiated into the room through the walls of the radiator coils, while the gases are drawn on into the exhaust pipe and discharged. The fan and discharge pipe are preferably placed in the basement so that all pipes can be given a downward slope for draining off any fluid products of combustion, a trap for disposing of them being placed near the outlet end. Each radiator is controlled by a thermostat through electric connections. When the temperature of the room rises one-half degree above that for which the thermostat is set, the gas is turned off automatically, while the valve is opened again and the gas lighted by the pilot light as soon as the temperature falls one-half degree below that for which the thermostat is set. With a clock thermostat the temperature may be maintained in a sleeping room at any desired degree during the night and arranged to change to a higher degree at a specified time in the morning.

BRUNEI, ONE OF THE QUEER SPOTS OF THE WORLD—Built on slender Nibong-palm piles over the Limbang River and surrounded by rolling hills, Brunei, the capital of that state in Borneo, is one of the most romantic and interesting places in the whole island. Although its houses are nestled close together into what appears a very compact area, this little city shelters 15,000 Malays, Kadayans, and Orang Bukits. Brunei, or Dar-ul-Salam, city of peace, as it is called by the natives, once was the stronghold of the famous Borneo pirates, and a renowned market for slaves. Since the once powerful sultanate has been reduced to a mere nothing in comparison with what it formerly was, the city has become a quiet little river village, and its people industrious traders with the interior tribes of Sarawak and British North Borneo. Many of the Malays are skillful brass workers, while the women spend much of their time making beautiful gold-threaded embroidery

EVAPORATION NOT A MENACE TO PANAMA CANAL

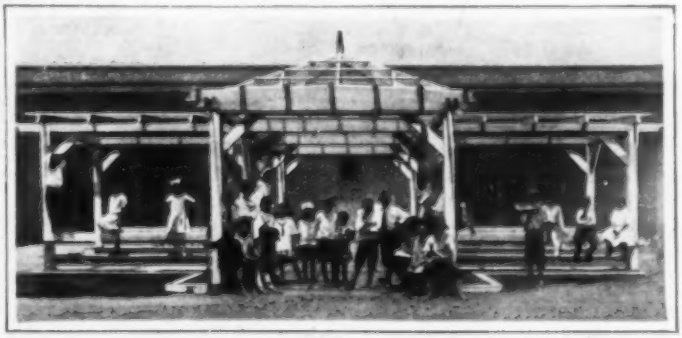
Conjectures as to how the level of Gatun Lake, and consequently the operation of the canal itself, will be affected by evaporation have been set at rest by the effects produced during the past dry season on the Canal Zone, during which time both the Gatun and Miraflores Lakes were practically at operating level with maximum surface exposed to evaporation, while the run-off from the watershed was the smallest known in 25 years. A careful analysis of the data obtained during this season shows that any fears that evaporation might have a serious effect on the operation of the canal are groundless. The run-off amounted to about 17,000,000,000 cu. ft., which is only 61 per cent of the water coming into the lake during a normal dry season. In spite of this fact it is estimated that if the canal had been open to traffic with 48 full lockages a day, and the Gatun hydroelectric plant in full operation, the water depth would not have fallen to less than 39 ft. in Culebra cut or the shallowest parts of the channel through Gatun Lake, a depth that is ample for any vessels that could be passed through the locks.

MONUMENT TO MEMORY OF "MARK TWAIN"

A monument to the memory of Samuel Langhorne Clemens, who was known throughout the civilized world as "Mark Twain," has been erected by the State of Missouri at Hannibal, a city in which this famous writer spent his boyhood and much of his later life. The monument occupies a commanding position in a park on one of the highest of the Mississippi River bluffs. The location is singularly appropriate, since it commands an extensive view of the river on which "Mark Twain" served for nine years as a pilot, and overlooks the scenes of two of his most widely read books, "Huckleberry Finn" and "The Adventures of Tom Sawyer."

OPEN-AIR LUNCH ROOM MADE FOR SCHOOL PUPILS

A pergola built on the playgrounds of a public school in one of the suburbs of San Diego is used by the children as an open-air lunch room. The custom of eating lunches in the classrooms was forbidden, and in order to provide a substitute place which would be both comfortable and healthful, this structure was built. As soon as the vines, which were planted by the children, have had an opportunity to grow, the roof and parts of the sides of the pergola will be covered with a thick green mat which will effectually protect it from the direct rays of the sun.



Pergola Used for Open-Air Lunching Place by School Children

GIRL HAS PROFITABLE BEE FARM ON CITY ROOF

On the top of a Philadelphia office building a girl stenographer has established a bee farm which not only affords her a pleasant diversion from routine affairs, but has become a lucrative source of income. What otherwise would be wasted area is taken up partly by several rows of hives which she looks after daily during her spare moments at noon and evening. The swarms of bees carry on their labors just the same as if their apiary were under a row of apple trees not far distant from a wide meadow of clover. Although the building is in the center of the business district and apparently miles from a pasture ground for the bees, they find the flowers somewhere, collect the honey and fly back to their hives without seeming to object at all to their metropolitan mode of life. Starting with only a few swarms as an experiment, the young woman has gradually built up her stock until it has developed into a thriving little enterprise which requires only a small amount of attention in comparison with its returns. Her product finds a ready market not many feet from its source of supply.

The Young Woman is So Familiar with the Bees That She Allows Them to Cluster over Her Arms

A Bee Farm in the Center of the Philadelphia Business District

Removing the Frames of Honey from the Hives

Smoking Bees Before Hives are Opened

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ASTRONOMER OFFERS PROOF OF CANALS ON MARS

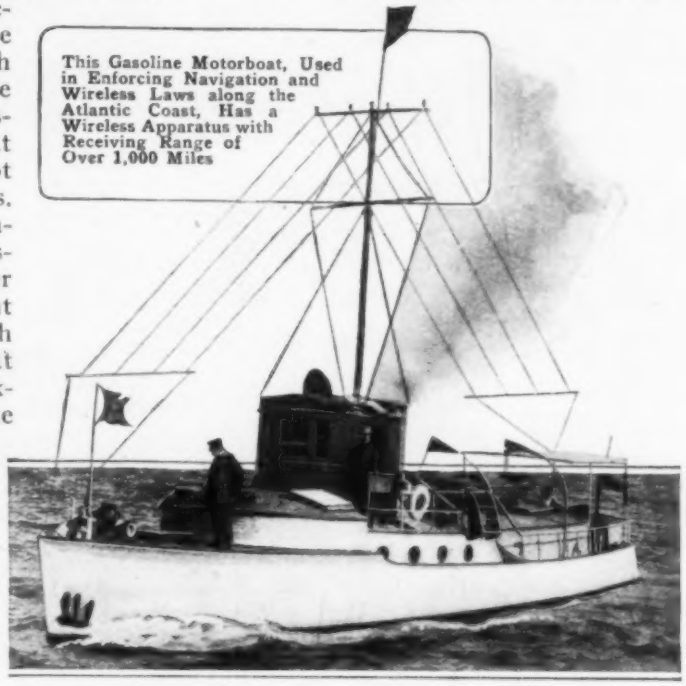
By the use of light filters which permit the passage of a single primary color into a lens, telescopic photographs have been made of Mars which appear to corroborate the theory that the lines visible on that planet are at least waterways, if not actually artificial canals. The work was accomplished by a Russian astronomer using a filter which admitted red light to a plate sensitive to such rays. The result was that the picture showed striking contrasts between the continents and seas, so called, of the planet, while the supposed canals appeared in exactly the same color as that of the larger bodies of water. One of the interesting points of the accomplishment is that the larger canals, estimated to be about 125 miles in width, appear on the negative as continuous and very regular lines. By a comparison of the photographs taken with a red light and those exposed under violet rays, the scientist claims to have demonstrated that light is diffused in the same manner by the atmosphere of Mars as it is by that of the earth.

RICH DEPOSIT OF ASPHALT FOUND IN PHILIPPINES

Asphalt of superior quality has been found in Leyte Province on the northwest peninsula of the Philippine island of that name. The vein, which was discovered by a government forester, is approximately a yard and a half in thickness and has been traced for a distance of 160 yd., showing thousands of tons of the product easily available.

MOTORBOAT PATROLS THE ATLANTIC COAST

For enforcing the navigation and wireless laws the Department of Commerce has in service a gasoline-driven boat that is constantly engaged in patrolling the Atlantic coast. This boat has a draft of only 4 ft., and is therefore able to go into shallow inlets and rivers to inspect the operation of motorboats, but it is also a seaworthy craft capable of making its way safely in the open sea. The boat is 66 ft. long, has a beam of 13 ft., and a maximum speed of about 15 miles an hour. The most remarkable feature about this boat is the wireless apparatus, which is unusually compact in view of its power and which has a receiving range of over 1,000 miles, although its sending range is much more limited.

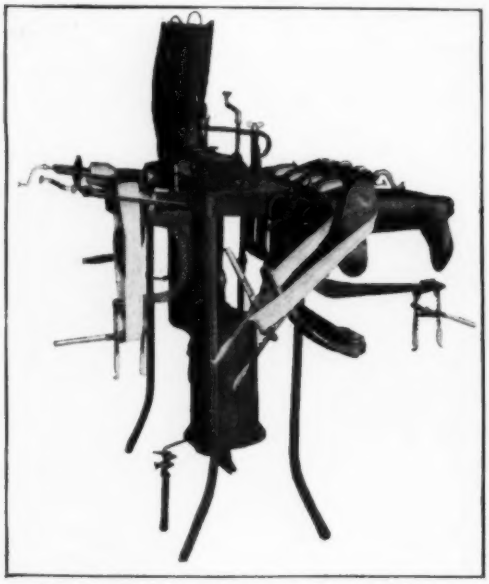


This Gasoline Motorboat, Used in Enforcing Navigation and Wireless Laws along the Atlantic Coast, Has a Wireless Apparatus with Receiving Range of Over 1,000 Miles

¶White-pine piles that had been in place more than 80 years were found to be perfectly sound when removed recently from pier foundations in North River at New York to make way for the construction of new docks.

DEVICE REMAKES WORN-OUT RUBBER FOOTGEAR

A machine which vulcanizes patches, soles, and heels on worn rubber boots

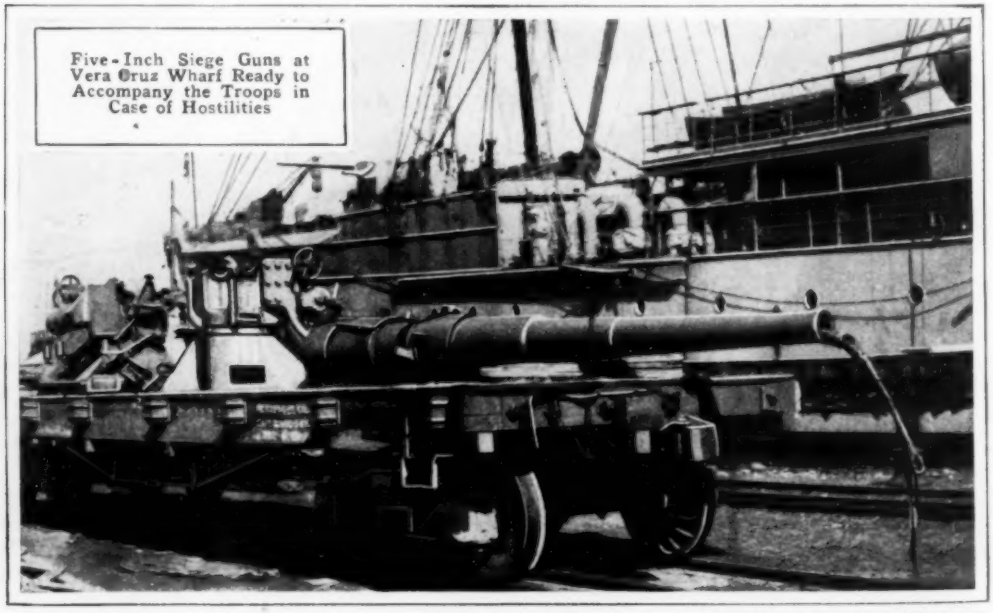


Machine Which Vulcanizes Patches and Parts on Rubber Shoes

and shoes, making them as waterproof as if they were new, is the invention of an Ohio cobbler. The apparatus is fitted with adjustable arms and forms which may be made to fit into any part of the footwear and hold it firmly in place during the repairing operation. Several pairs may be mended in this way at one time, the addition of a new piece of work to the machine not interrupting that already in progress. With this device, a boot which has suffered the loss of a sole or toe may be made serviceable again by a simple operation.

VERA CRUZ TROOPS READY FOR MARCHING ORDER

Ever since the United States fighting forces were stationed at Vera Cruz everything has been in readiness for orders directing the troops into the interior of Mexico, or wherever the first blow would be struck in case of intervention. All the military equipment has been so assembled that the advancement of that part of the army could begin almost as soon as a command were given. Heavy 5-in. siege guns, and other equipment, have been secured on flat cars along the wharves, and kept in waiting for the word to proceed to the capital.



Five-Inch Siege Guns at Vera Cruz Wharf Ready to Accompany the Troops in Case of Hostilities

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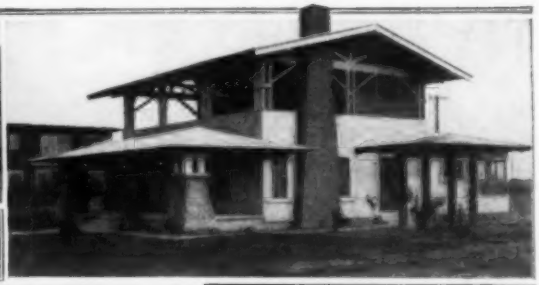
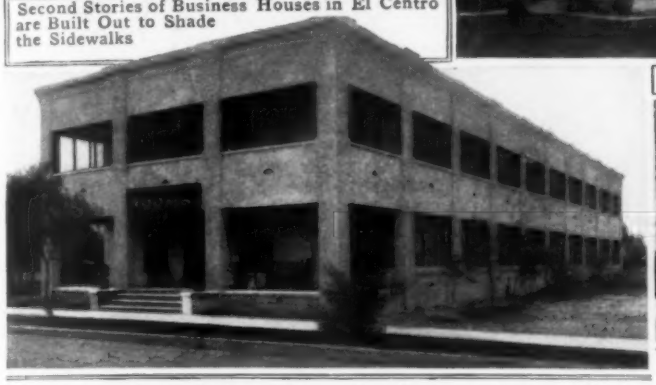
Second Stories of Business Houses in El Centro are Built Out to Shade the Sidewalks





Apartment House with Every Room Opening into a Screened Porch

No Walls to Second Story of House

The Screened Porch Equipped as an Outdoor Sleeping Room; Certain Porches are Reserved for Women

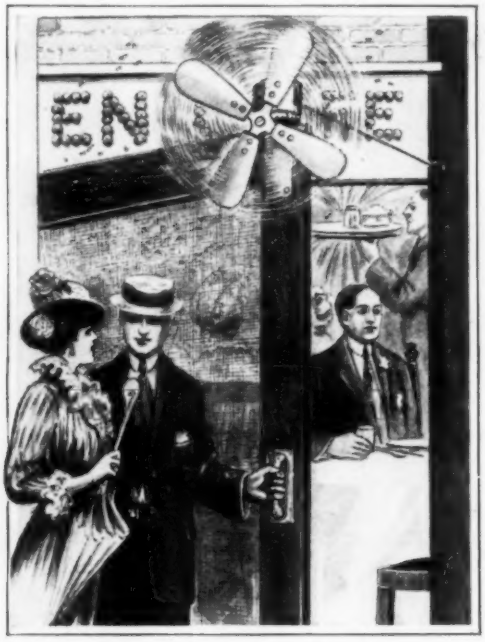
HOW THEY KEEP COOL IN THE IMPERIAL VALLEY

Although the temperature is often extremely high during the summer in the Imperial Valley of southern California, the 50,000 or more persons that live in this reclaimed portion of the desert do not find the heat particularly trying, for the reason that they make intelligent provision for counteracting the effects of the heat. This is strikingly shown in the construction and arrangement of the buildings, in which a new style of architecture has been developed that is particularly adapted to a hot and dry climate. In every town in the valley the business buildings are built with the second stories, supported by columns, extending out over the sidewalk and forming a shady arcade for pedestrians as well as adding to the floor space of the second stories. Practically all the residences are built with double roofs to intercept the heat of the sun, while many of the houses have screened porches that are used as sleeping quarters during the summer. In nearly all the two-story houses the second stories are built without walls and are equipped with canvas drops that can be easily raised or lowered and are placed between the roof supports. Each room in an apartment house or hotel is arranged to open into a screened porch or corridor, and beds are provided both in the rooms and on the porches. In the hotels certain porches are reserved for women and others for men. Even the barns are arranged in such a way as to permit the freest circulation of air, being built without sides and consisting only of thatched roofs supported by studding and rafters. The thatching material is laid on wire netting stretched over the rafters, and to prevent damage by wind, is securely wired to the netting.

KEEPING FLIES OUT WITH AN AIR BLAST

The effectiveness of an outwardly directed blast of air in driving flies away from the opening when a door is opened has been pretty well demonstrated, and two interesting devices, one electrical and the other mechanical, have recently been invented for accomplishing this. The electrical device consists of a cylinder containing a

series of blower fans operating on the same vertical shaft, and having a vent opposite each fan. At the top is a small electric motor for operating the fans.



Fan That Keeps Flies Out When Door is Opened

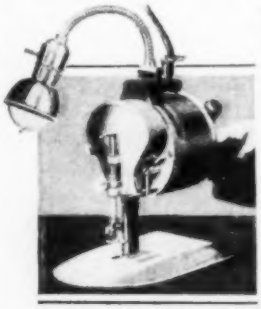
This cylinder is fixed vertically to the inside door jamb, adjacent to the swinging side of the door, with the vents directed across the door opening. The motor is controlled by a switch at the top of the door frame. As long as the door is closed it bears against the switch and the current is shut off, but the instant this pressure is taken away the current is turned on, the fans are started, and a blast of air is thrown outward and across the opening. The other device is simply an open fan supported at the top of the door on the outside and geared to a small drum. Wound around the drum is a cord which is attached at one end to the door jamb. As the door is opened the drum, and with it the fan, is rotated by the cord and a current of air is thrown outward and away from the opening. This process winds a spring in the drum, and the door is pulled shut, as soon as released, by the action of the spring on the cord.

LAMPBLACK EXTRACTED BY ELECTRIC CURRENT

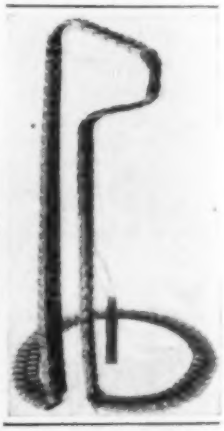
A new process recently developed by a German scientist for extracting lampblack from an ordinary flame consists simply in passing through the flame a direct electric current having a pressure of about 15 volts. The apparatus consists essentially of two electrodes which are introduced into the flame. Under the action of the current the lampblack is deposited on the negative electrode. The commercial possibilities of the process lie in the fact that the lampblack obtained in this way is more finely granulated, and therefore better suited for use in paints and printers' inks, than the lampblack produced by present methods.

CLOTH-CUTTING MACHINE LIKE BAND SAW

An ingenious cloth-cutting machine that has just been brought out not only cuts up 150 thicknesses of material at one time, but cuts accurately and evenly to any curved pattern. This machine is portable, is operated by electric power and resembles an electrically driven band saw, the cutting being done by a series of small knife blades mounted on an endless band.



Cloth-Cutting Machine Handles Many Thicknesses



At Right: The Chain of Cutting Blades

The band works on systems of pulleys above and below the worktable, but is in a vertical position, with the edges of the blades downward, at the level of the table where the cutting is done.

Enormous Figure Used in Street Decoration

At the Right is Shown the Head of the Elk; the Ears are 5 Feet Long, the Eyes 1 Foot in Diameter, and the Distance Spanned by the Open Mouth is 2½ Feet

ENORMOUS ELK FEATURE OF DENVER JUBILEE

A striking feature of the convention of a fraternal organization held in Denver recently was the enormous figure of an elk placed across one of the principal streets. The length of this figure was 48 ft., while it stood 66 ft. from street level to the tips of the antlers. The body alone was 28 ft. in length, and was supported on legs 18 ft. long. The ears were 5 ft. long, the eyes 1 ft. in diameter, while the opening of the mouth, as shown in the illustration, was 2½ ft. This figure, which was built in seven sections, was supported on a clifflike pedestal that reached across the street from curb to curb, and at the center of this pedestal was an arch, 14 ft. high and wide enough to accommodate street traffic.

SANITARY ICE-CREAM DISH ELIMINATES WASHING

Sanitary ice-cream dishes for public use are being made to solve the dish-washing problem at soda fountains, where in several cities unsatisfactory conditions have attracted the attention of the state health authorities. Of late this work has been made more difficult than formerly by the popular demand for sticky sirups, which cannot be readily removed from a dish without the use of hot water, a thing not provided at the majority of small stores. The new method eliminates entirely the customary dish and substitutes a sugar-maple container which is inserted in an especially designed metal holder. The wooden dish is held in

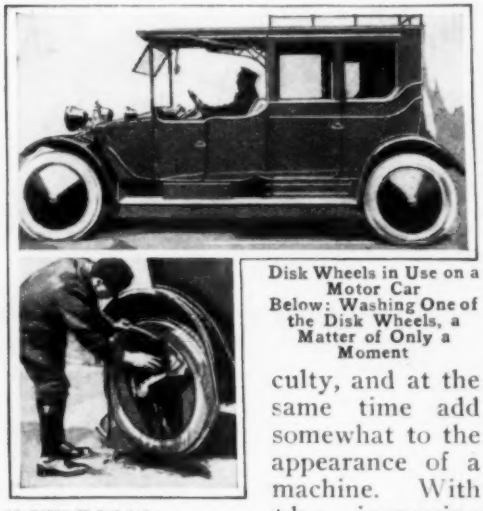
Wooden Dish Makes Sanitary Ice-Cream Container

place by three small lugs while a hole in the outer dish large enough to admit the thumb provides for its removal.

¶In a watch valued at $2,500, recently made for exhibition purposes, is a wheel that makes a complete revolution once in four years. This wheel operates dials showing the day, month and year, and serves to give February its extra day in leap year.

DISK MOTOR-CAR WHEELS ARE CLEANED QUICKLY

Celluloid-disk wheels for motor cars is one of the late inventions designed to simplify the spoke-cleaning difficulty, and at the same time add somewhat to the appearance of a machine. With the increasing use of wire spokes, the work of cleaning a car is growing, and it was with the intent of lessening this that the new wheel was conceived. The disks do not affect the strength of the wheel, but merely act as a covering for the spokes, the inside shield being permanently fixed, while the outside one is held in position by a single nut, giving easy access to the tire valve and security bolts. The cases are highly polished and may be cleaned in a moment's time by washing.



COURTESY OF THE CAR

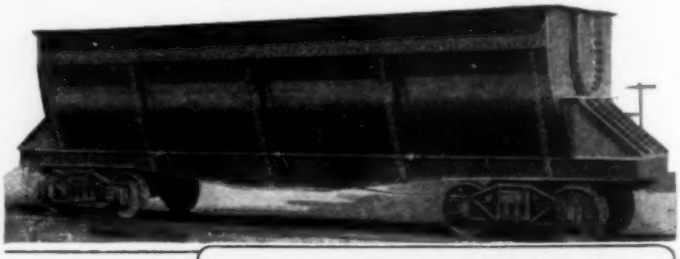
Disk Wheels in Use on a Motor Car
Below: Washing One of the Disk Wheels, a Matter of Only a Moment

UNDER-WATER BELT JOINS MILL AND TERMINAL

By the construction of a ship canal at Brussels a large flour mill was separated from a railway freight terminal, making the problem of loading the factory's output aboard cars a serious one. Means of conveying the barrels of flour rapidly to the other side of the canal was vital, so a tunnel was built under the water and a belt conveyor, with a capacity of 66 tons an hour, placed within it. The tube consists of a pipe, 350 ft. long, which was sunk into an excavation in the bottom of the canal. As the flour is shot through the bore it is delivered onto an elevator which conveys it to the loading platform of the warehouse.

CAR FOR HAULING GARBAGE BY RAIL

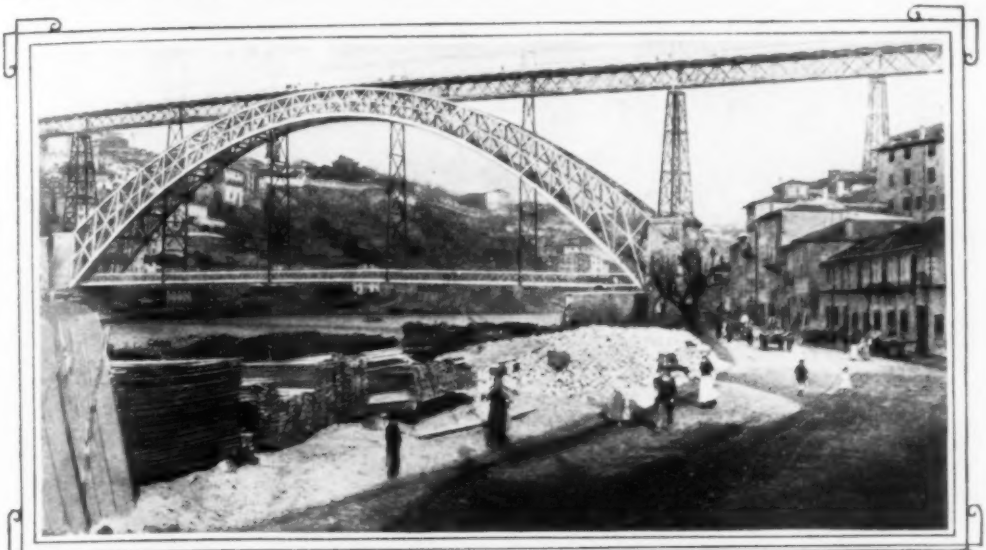
Transporting garbage from the point of collection to the garbage-disposal plant is usually a troublesome matter, particularly in cases where the plant is located at some distance from the city. To provide a means of handling garbage under such conditions so as to avoid the nuisance of leakage and at the same time obtain economy in operation, a water-tight car has been designed and is being introduced in several American cities. This car is built to meet railroad requirements and has a capacity of from 1,200 to 1,800 cu. ft. It consists simply of a tank with semicircular bottom, supported on rockers at the ends and on rollers at the intermediate points, so that it can easily be dumped and righted.



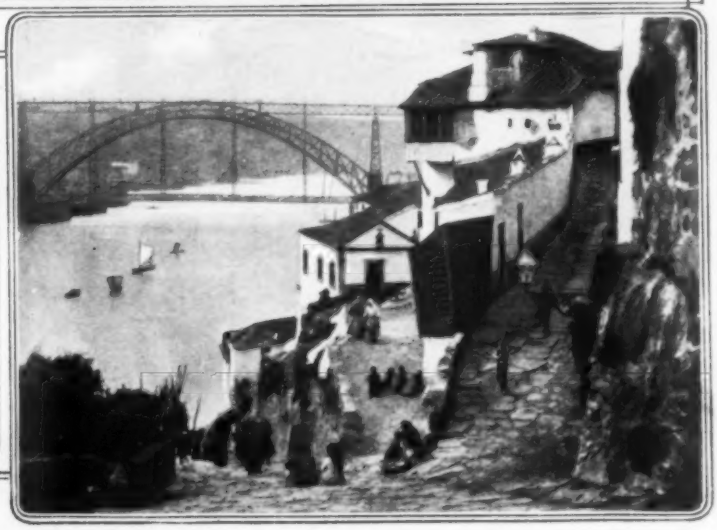
Garbage-Disposal Car Supported on Rockers and Rollers so That It is Easily Dumped and Righted

¶ Movie films are being made to show tree planting, cutting timber, and patrol and lookout work of the Forest Service.

BRIDGE WITH VIADUCTS AT HIGH AND LOW LEVELS



View of Dom Luiz Bridge over River Douro at Oporto, Portugal. The Vertical Distance between Upper and Lower Viaducts is 164 Feet



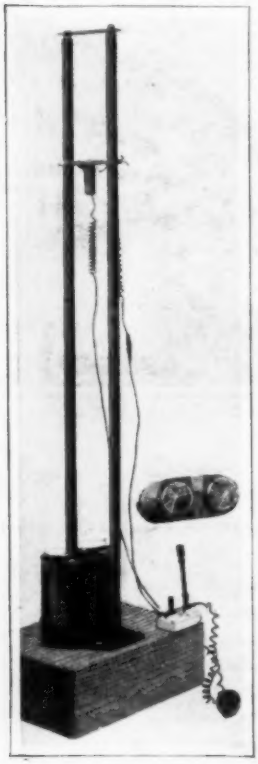
View of Bridge from the Cliffs. The Houses in This View are Several Hundred Feet above the River Level

One of the most curious of the famous bridges of the world is the Dom Luiz bridge over the river Douro at Oporto, Portugal. This bridge has a single steel arch, 566 ft. long, which spans the entire river. Supported on the top of the arch, at a height of over 200 ft. above the river, is a steel viaduct connecting the parts of the city that are built on the high cliffs along both sides of the river, while suspended from the arch by steel bents is another viaduct that connects the low-level streets along the banks. The vertical distance between the upper and lower viaducts is 164 ft. The lower viaduct is at such a height as to allow safe clearance for the wine boats that ply the river Douro.

¶Motorcyclists employed by an automobile association to patrol New England highways to warn motorists of speed traps and give first aid in case of trouble have proven a popular innovation in the East.

MACHINE TESTS GOGGLES OF STEELWORKERS

Goggles worn by chippers in one of the large steelworks, to protect their eyes from flying particles of metal, are submitted to severe tests to determine the quality and strength of the glass used in the lenses. A special testing machine shows the action of the glass under conditions similar to those met with in actual work. The apparatus consists of two uprights which support a magnet. A ⅝-in. steel ball, weighing about ½ oz., is held 21 in. above a block on which the goggles are fastened. By breaking the electric current the ball is allowed to fall upon the lens. The specifications require that from each shipment of one gross, a dozen goggles must be tested in this manner, and of that number a fourth must stand the impact of 15 blows of the ball.



NEW SUBMARINES TO BE LARGEST YET

In advance of anything yet built for European navies, the new submarines now under construction for the United States will be larger, have a greater cruising radius, and be more powerfully equipped than any yet attempted on either side of the Atlantic. The new craft, which because of their large reserve of buoyancy are really submersibles instead of submarines, are 265 ft. long, with a beam of 23 ft. and a draught of 13 ft. On the surface they are designed to make a speed of from 12½ to 18 miles an hour, with a capacity for limited periods of 23 miles. Submerged, the best speed will be 12½ miles, and fuel capacity is arranged for from 3,500 to 7,000 miles' range. The hull is strongly reinforced, with double construction amidships, and the 10 compartments bulkheaded off are dished to withstand extreme pressure. There are 10 torpedo tubes and 14 torpedoes, and a 3-in. disappearing gun is also provided. Safety devices, both automatic and mechanical, free the ballast tanks of water at certain depths, and three escape compartments, one at either end and one in the middle of the boat, open into air locks, each equipped with a telephone buoy release for communication with the surface when submerged.

BUILDINGS DECORATED WITH COLORED CEMENT

A recently invented process for making colored cement apparently opens a new field of possibilities in the making of decorative panels for buildings, and in the decorative treatment of cement surfaces. It is claimed that by this process the quality of the cement is not damaged in any way, and that the colors are permanent, the colored cement becoming a part of the cement surface to which it is applied. It is ordinarily applied to slabs or panels, which are then set in spaces left for them in the building wall. The lines of the decorative figures are raised about ⅛ in. above the adjacent surface, and are made slightly irregular in order to produce a picturesque effect.

ODD MUSIC MAKERS OF THE EASTERN HEMISPHERE

The Japanese Samisen is Made of Wood Covered with Cat Skin

This Curious One-Stringed Violin is Used by the Natives of Mount Abu, India. The Arched Bow Carries a Group of Bells

The Hindu Banjo Player Delights Particularly in the Queer Traditional Melodies of India Which are Handed Down from Father to Son. A Long, Cumbersome Neck is Characteristic of His Instrument

Chinese Stringed Yang-Kin Resembles a Zither

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ODD MUSIC MAKERS OF THE EASTERN HEMISPHERE

In Japan the Moon Banjo, So Called Because of Its Round Form, Lacks the Twanging Sound of the American Instrument and is Loved for Its Sweet, Soft Tones

The Brass Trumpet Which This Chinese Troubadour is Blowing is Called a La-Pa. On His Left Arm Hangs a Sona, a Sort of Bamboo Clarionet

This Odd Group Constitutes a Javanese Boys' Band. The Devices They Carry are Known as Onklongs, Each of Which is Tuned Differently

Photos Copyright Underwood & Underwood

ODD MUSIC MAKERS OF THE EASTERN HEMISPHERE

The Siamese Saw-Duang has Two Silk Strings Which are Tuned Alike and Played Together as If They were One

Combination Xylophone and Drum with Which an African Minstrel Welcomes a Stranger

On Festival Occasions a Tom-Tom-Like Instrument is Played by Singhalese Maids of Ceylon. The Music is Produced by Tapping with the Fingers

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STREET MADE REFRESHING BY FLOWER BOXES

Designed to embody beauty as well as service, lamp-posts erected on one of the streets of Los Angeles are fitted with large flower boxes which circle the poles just beneath the cluster of lights which they support. These are filled the year around with ferns and other plants which droop gracefully over the sides of the baskets, always fresh and green. The effect is striking, giving the street just enough of the artistic to take away from it much of that severely commercial appearance characteristic of most business thoroughfares in American cities.

MOTOR TRUCKS TO FEED FREIGHT TRAINS

A Canadian railway is planning a system of auxiliary transportation that will have the effect of extending the railway right into the barnyard or field of the farmers living along the line. This service will consist of a fleet of motor trucks operated from each station by the railway company and specially designed for collecting farm products, including grain, and transporting them to the railway. The number of motor trucks at different stations will vary with the size and importance of the districts served, but it is expected that from 12 to 20 will be placed in service at the more important stations.

HOW COPIES OF LABELS ARE MADE BY THE GOVERNMENT

A photographic apparatus has been adopted by the Department of Agriculture for copying labels in connection with the enforcement of the pure food and drugs law. With this apparatus the original is photographed directly on paper without the use of a negative, and the copy made in this way is accepted in court as evidence in place of the original document. A prism placed in front of the camera deflects the light at a right angle. With this arrangement a document that is to be photographed is laid flat on a table with the camera placed above it. This feature also makes the apparatus a particularly convenient instrument for photographing the tops and sides of boxes, barrels, and other bulky containers.

HONOLULU RAILWAY SIGN PRINTED IN SIX TONGUES

The cosmopolitan character of the population of the Hawaiian Islands generally is appreciated only by the comparatively few persons who have toured or made their residence there. A curious sign, which illustrates the large number of different languages spoken by the inhabitants of Honolulu, is to be seen at one of the railway bridges in that city. In order to warn persons not to use the structure as a footbridge, it was necessary for the company to erect a sign explaining the same thing in six tongues: English, Hawaiian, Portuguese, Chinese, Japanese, and Korean.

NOTICE
WALKING ON THIS BRIDGE PROHIBITED.
KAPU AOLE HELE MALUNA O KEIA UAPO.
NESTA PONTE E PROBIDO PASAR QUAL QUER PESOA
H.R.T. & L.Co.

EXTINGUISHING APPARATUS FOR OIL FIRES

The Flame Smothered by Extinguishing Foam 22½ Seconds After the Fire had Started

A Close View of the Tank Showing How the Wires and Fusible Links are Arranged

The Fire That Resulted from a Lighted Match Thrown into the Tank of Gasoline

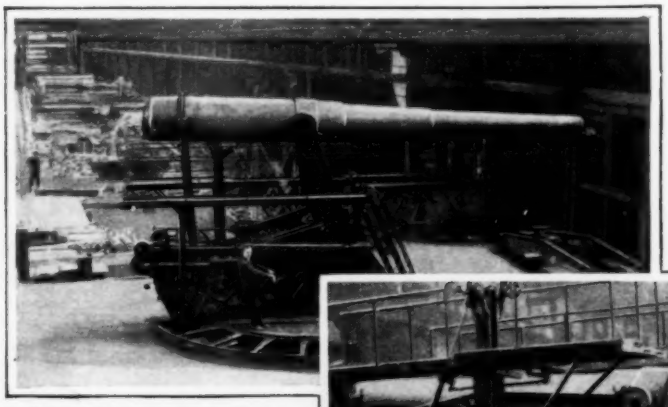
When any considerable quantity of oil, particularly gasoline, catches fire, the result is usually the worst kind of fire there is and the hardest to put out. Combinations of chemicals have been invented that can be made to form a foam over the surface of the oil and smother the flame, but the greatest difficulty has been in applying these chemicals quickly and effectively. An apparatus recently demonstrated in Chicago apparently solves this problem and provides a means for extinguishing such fires automatically and within a few seconds after the fire starts. The chemicals are placed in

standpipes arranged around the side of the tank and having their outlets projecting over the surface of the oil. Wires with fusible links at the centers are stretched across the tank, and the whole installation is simply left in place as a guard against possible fire. As long as the wires are taut the apparatus is inoperative. In case of fire the links are fused, the wires drop, and the apparatus that mixes the chemicals and discharges them through the outlets of the standpipes is set in operation. In the tests referred to a lighted match was thrown into the tank, and the gasoline burst into flame instantly. In 10½ seconds the fusible links had been burned away and the foam began flowing from the standpipes. In 12 seconds more the fire had been completely extinguished.

In actual service it is only necessary, after a fire, to replace the wires and place a new supply of chemicals in the standpipes to be in readiness for the next fire.

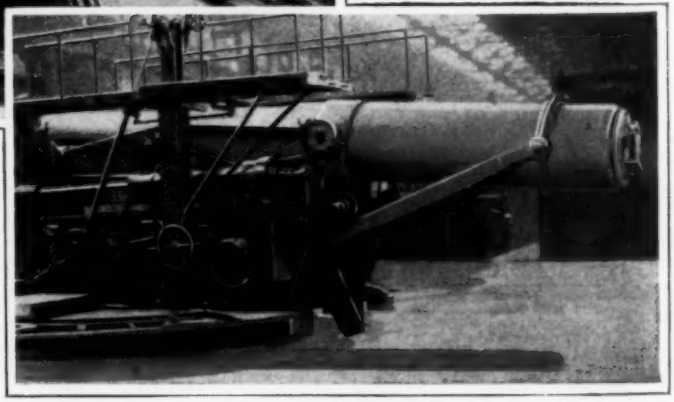
BUILD LARGE DUMMY GUNS TO TRAIN MILITIA

In order to familiarize members of state military organizations with heavy coast-defense armament, the war department is installing big dummy guns in the armories of several of the seaport cities. They are built of cast iron and boiler-plate material, and are equipped with standard types of breech mechanism. While the mounts are of the standard form used in seacoast fortifications, they are made up of cheaper materials. The guns are equipped with regulation sights and are provided with an outfit of dummy projectiles, powder charges, and other equipment.



One of the Dummy Guns in Firing Position

Subcaliber devices enable the use of .22 and .30-caliber ammunition in the big 10-in. disappearing guns and 12-in. mortars, so that target practice may be carried on within the armory. These machines are costing the government approximately $30,000 each and are being installed in seven cities on the Atlantic and Pacific coasts. The personnel of the militia of the several states in this manner will be in trim for the annual encampments at the coast fortifications. In the regular gun, the recoil forces it back into the loading position, but in the dummies this is accomplished by electric motors.



A Dummy Disappearing Gun in Loading Position

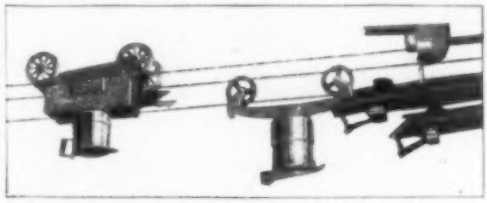
Light Motor and Equipage Used in Interior of Canada. Broad-Tread Tractor Wheels Plow Car through the Mud

CAR USES TRACTOR WHEELS TO CROSS BAD ROADS

In the Peace River country of western Athabasca, Canada, the territory is interlaced with small rivers and provided in places with very poor roads. A motor service, however, is maintained between Grouard and points on Peace River. While a light car is used, the character of the land is such that, with ordinary tires, it would be impossible for the machine to force its way through the district without severe difficulty. In order to make the trips possible and to facilitate matters in fording streams, heavy tractor wheels are used on the car in places where the mud is deepest. When fair roads are encountered the iron rims are removed and the rubber tires substituted.

CASH CARRIER OPERATED ELECTRICALLY

Springs, pneumatic power and gravity have long been employed for operating the small overhead carriers used in department stores and other mercantile establishments, but what is believed to be the first successful device of this kind using electric current as motive power has just made its appearance. This carrier is equipped with a small electric motor and runs on two wires from which it takes its power. The whole machine weighs 3 lb. and is capable of taking a load of 27 lb. up an incline having a rise of 30 ft. in 100 ft. It is started by pushing a lever either way, depending on the direction it is to go, and when it reaches its destination it locks itself in the same manner as the ordinary carrier, while the current is automatically



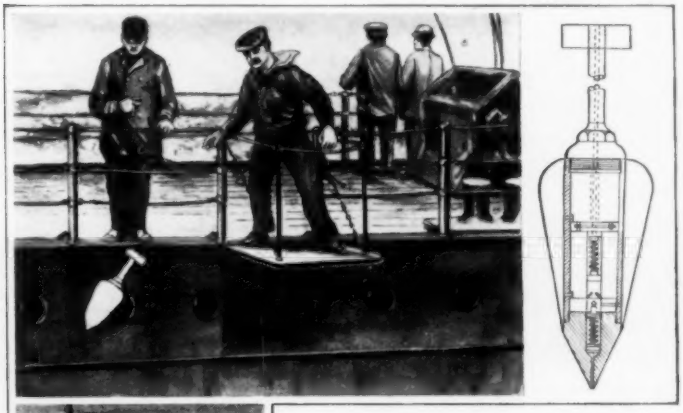
Electric Carrier Coming into a Station; the Machine in the Background is an Ordinary Spring Carrier

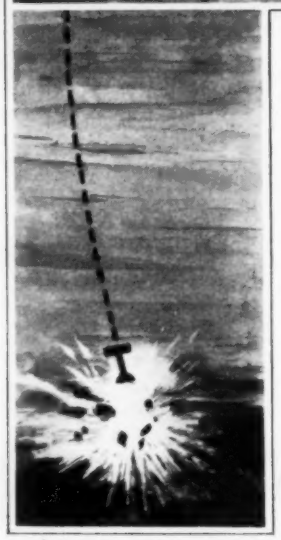
shut off. A novel feature about the machine is that it can be adjusted to drop a message at a given station and then return automatically to the sending station.

¶ Persons desiring to hunt pearls within the state of Texas must now obtain a permit. The state purposes to conserve pearl-bearing mussels.

DEEP-SEA SOUNDINGS MADE BY MARINE BOMB

With the intention of overcoming the difficulties often encountered in making deep-sea soundings, a bomb has been constructed which completely changes the methods ordinarily employed in measuring the depth of water. It consists of a projectile-shaped steel tube which carries a charge of dynamite and electric batteries for exploding it. This is dropped overboard from a ship and explodes upon striking bottom. It is possible to hear the report, since water is a good conductor of sound, and the time elapsing between the dropping of the bomb and its explosion indicates accurately to the mariner the water depth. The head of the instrument is heavily weighted and contains a small orifice which permits the entrance of water. This presses upon a piston which actuates a spring and causes a contact pin to connect with one terminal of the electric circuit. A rod passes through the main cylinder and controls another spring which, when free, completes the circuit and explodes the dynamite. During the transit of the apparatus through the water, however, fan vanes at the extreme end of the main rod, being at right angles with the motion of the sinker, hold back the spring and prevent a premature discharge. When the bomb reaches the bottom, motion ceasing, the vanes fail to restrain the spring. Contact is then made, and the explosion follows immediately. The operation destroys the instrument, but the time saved represents more than its cost.





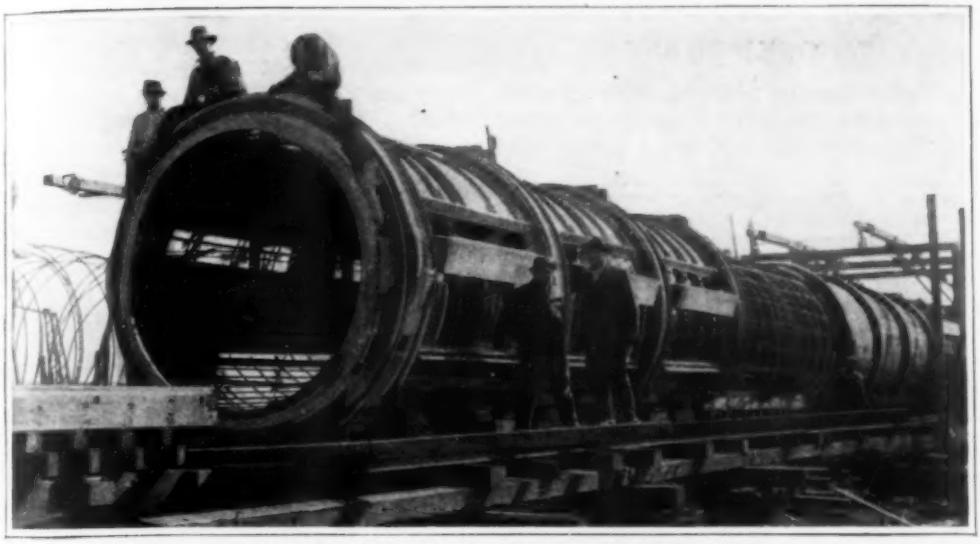
Sounding Bomb Which Explodes When Bottom of Ocean is Reached

TWELVE-INCH GUNS REACH FIRE-CONTROL LIMIT

In tests at the army proving ground at Sandy Hook, 12-in. guns firing 700-lb. projectiles recently attained a range of more than 11 miles, breaking all previous records and actually reaching the limit of fire control. Military authorities are of the belief that it would be impossible to develop a range finder which would make operations beyond this distance effective. It is pointed out that the only value of a larger gun lies in the ability of its projectiles to carry greater amounts of explosives and, because of increased muzzle velocity, to travel in a straighter line.

MASSIVE PIPES OF CONCRETE ARE BUILT FOR SEWER

As an illustration of the things being accomplished in concrete construction work, sections of reinforced-concrete pipe, each weighing 61 tons, are being made as a part of the Passaic Valley

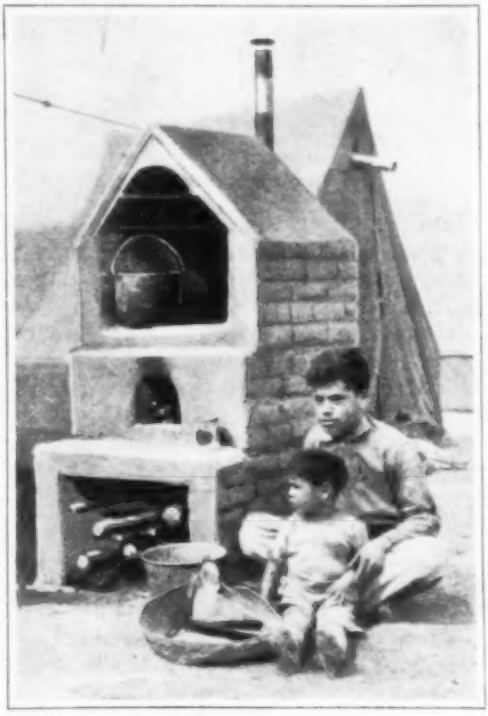


A Mold for One of the Large Sections of Concrete Pipe

trunk sewer which will carry the sewage of a large part of the state of New Jersey into New York Bay. The segments are 50 ft. long and 8 ft. in diameter, and are tested to withstand a pressure of 5 lb. to the square inch. Sixty sections of straight pipe and 30 elbows of various sizes are being made, and when completed will be sunk in the bay from pontoons. A channel has been dug in the bottom to accommodate them, and as soon as they are put in position they will be bolted together and then covered with a riprap of large rocks to protect them from the anchors of ships.

ADOBE OVENS BUILT BY MEXICAN REFUGEES

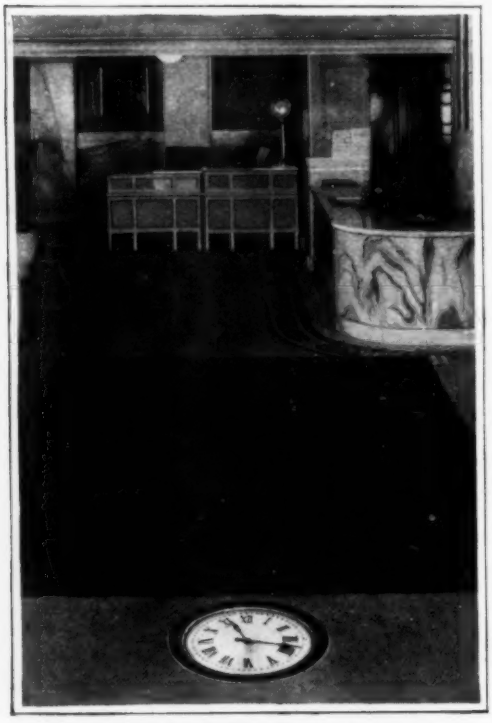
During the time that Mexican refugees have been held under Federal guard at the camp at Fort Wingate, N. M., many interesting adobe structures have been built, by the natives, with sun-dried bricks. The accompanying illustration shows an outdoor oven built by an officer who had been under the command of General Orozco. It was made entirely by hand, tools not being allowed the prisoners because of fear that they might be employed as weapons. The bricks were made from the desert earth mixed with straw from bed sacks. The oven, when completed, had three compartments, one of which, located below the fire-box, was used for drying wood for fuel.



Adobe Oven Built, without Tools, by Mexican Refugees at Fort Wingate, N. M.

CLOCK IS BUILT IN FLOOR OF HOTEL LOBBY

In the floor of the lobby near the entrance of a recently constructed hotel at Worcester, Mass., is an electrically



Novel Clock Forms Part of Hotel-Lobby Floor

illuminated self-winding clock. Bronze rings, set in the tile, support the plate-glass face of the instrument, which is 2 ft. in diameter. The numerals and division marks are etched on the reverse side of this, forming the dial, while electric lights placed beneath each figure furnish adequate lighting. The clock is wound by a small motor which is supplied with power from dry batteries.

PLOWING BY ELECTRICITY CHEAPER THAN HORSES

From experiments which have been conducted of late near Florence, Italy, it is reported to have been demonstrated conclusively that electric plowing has a direct advantage over all other mechanical methods of tilling the soil. The small initial cost of the needed equipment, the low maintenance charge, and the efficiency derived from the energy consumed are cited as the points contributing to the success of the process. The work is done by a stationary apparatus consisting chiefly of a motor-driven capstan and hauling cable. The running arrangement is composed of a truck hauling disk plows which cut to a depth of between 18 and 20 in., and which will plow approximately 89 acres before it is necessary to change the position of the stationary plant. The cost of the work, with the power rate set at about five cents a kilowatt-hour, was estimated to be about one-half that of plowing the same area with horses, and two-thirds the expense of steam plowing.

EXPLOSION CAUSES TRAGEDY AT PANAMA CANAL

Several persons were killed and 11 injured when a premature explosion of dynamite at the base of Cucaracha slide wrecked and sank the drill barge "Teredo" in the Panama Canal late in July. The casualties resulted from the destruction of the boat, and not directly from the concussion. When the last of eight holes drilled in a large rock under the water was being charged with dynamite, the explosion occurred. A gushing of water and the emission of yellow smoke from the casing were the only indications of danger given. A drill runner, seeing this, dashed to the side of the barge and shoved away the boat, which carried a store of dynamite, thus averting what easily might have caused an even worse disaster. A moment later the under-water explosion tipped the "Teredo" and sank it, only eight of its 26 workmen escaping serious injury.

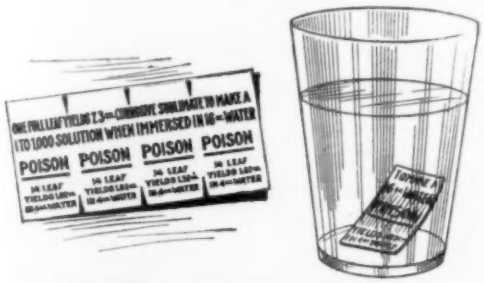
¶From 1,325,000 tons of tar annually produced in Great Britain by the destructive distillation of coal, about 10,000,000 gal. of benzol are obtained.

FLYING MACHINE IS USED WHEN WIRELESS FAILS

What a flying machine can actually accomplish in the way of service when a necessity arises was demonstrated recently when the time element became important in the transmission of a long message from the U. S. S. "Mississippi" to the Navy Department during a trip from Pensacola to Hampton Roads. The length of the telegram coupled with local disturbances precluded filing it by wireless. The vessel was stopped 25 miles out from the Chesapeake capes and a naval flying craft shot into the air and headed for the Virginia coast. The telegram reached Washington three hours before the "Mississippi" arrived at Hampton Roads.

ANTISEPTIC PAPER USED INSTEAD OF TABLETS

The distressing accidents occurring so frequently through mistaking bichloride-of-mercury tablets for harmless confections or medicines may be avoided by means of an article just put on the market. Small sheets of unsized paper are impregnated with the bichloride-of-mercury solution in definite strength, one sheet of paper, immersed in water, giving in less than two minutes an antiseptic solution of the standard strength obtained with tablets. It is obviously impossible to mistake these leaves for any kind of harmless medicine, the more so as the

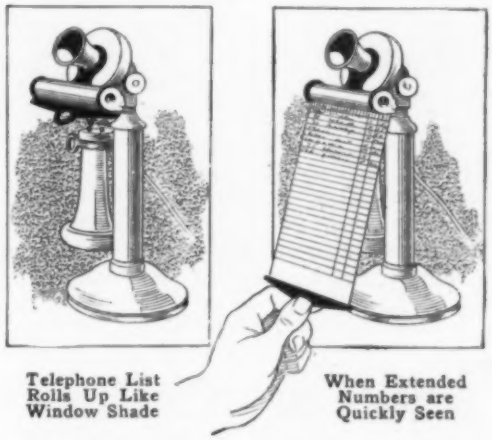


Small Leaves of Paper Contain Bichloride for Antiseptic Solution

poison sign and a warning are plainly printed in red upon each leaf, together with full directions for using.

TELEPHONE LIST ROLLS UP WHEN NOT IN USE

A number of devices have been patented having for their object the convenient placing of frequently used



Telephone List Rolls Up Like Window Shade

When Extended Numbers are Quickly Seen

telephone numbers near or upon the telephone instrument. None of them takes less space or gives easier access than a small roller, made on the familiar principle of a shade or curtain roller, the numbers being listed in rotation. It is only necessary to pull down the little curtain, or roll, to find any desired number.

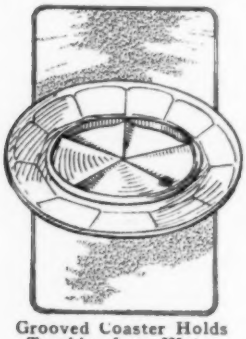
USE GLASSES TO LOCATE LINE TROUBLES

Field glasses have been found satisfactory for use in the detection of line troubles on the transmission system of an eastern electric railway. Through their use the interruptions in service formerly occasioned by all manner of defects has been minimized greatly. Examination showed that the vibrations of the supporting poles caused by the passage of cars loosened insulators and wires, bringing about conditions which sooner or later caused trouble. Careful inspection failed to eliminate the difficulty until the idea of furnishing the examiners with binoculars was suggested. One man in 10 days located 161 defects on a line 40 miles in length, which, it is declared, could not have been discovered by the naked eye.

NOVEL AND PRACTICAL THINGS FOR DAILY USE

Sugar Bowl Protects Contents from Flies

ARRANGED so that it will open and close automatically, a sugar bowl has been made which is designed to protect the contents against contamination by dirt and flies. The dispenser is jar-shaped and supplied with a cover which screws tightly in place. Extending through this is a tube fitted with an automatic cap which opens as the bowl is inverted, allowing the sugar to flow, and closes when the bowl is not in use.

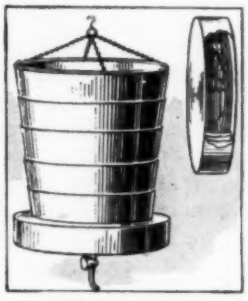


Grooved Coaster Holds Tumbler from Water

During the summer months when iced beverages are served, the moisture which accumulates on the exterior of a tumbler ordinarily is caught in a saucer and then in turn drips over a person's clothing when the glass is raised. To overcome this, a small tray has been patented having ridges which hold the glass above the water which drains from it.

Flashlight Also a Cigar Lighter

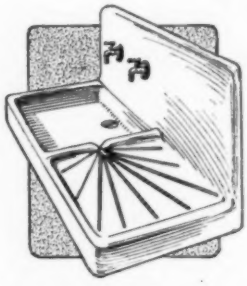
For the convenience of the motorist who finds it difficult to light a cigar while driving in an open car, an electric igniter has been invented which forms a part of a flashlight. The device instead of containing its own batteries has a long double strand of wire which connects with the batteries carried in the car. The cigar-lighting part of the arrangement is attached to one side of the handle of the lamp.



Vessel Folds into Compact Form

An irrigating fountain which may be folded so that it is only 2 in. in height, may be easily packed in a suitcase or traveling bag. It is made of German silver, will hold about 2 qt., and may be sterilized without difficulty.

A kitchen sink is being made which has as a part of it a level porcelain drain board that eliminates the possibility of china slipping and breaking when lifted upon it from a dishpan. A raised rim portions off the two parts, while rounded channels, depressed in the surface of the drain, lead the water into the sink.

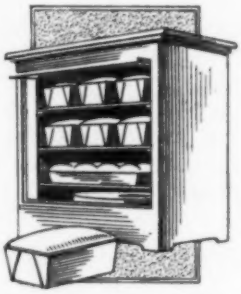


Kitchen Sink Has Level Drain Board

An alarm clock which, instead of awakening a person by a sharp, violent ring, fills the room with the strains of his favorite melody at the appointed hour, has been built. It consists of an eight-day clock, of usual appearance, built into a phonograph box.

Clock Awakens Sleeper with Strains of Music

Made in sizes suitable for household use, a bread-raising cabinet, which provides a warm, damp atmosphere in which to place dough after it has been kneaded, has been given a patent. A stone similar to that used with a fireless cooker is heated and then placed in the bottom of the box. Pans of dough are set on the shelves provided for them, a small amount of water is poured on the stone, and the door then closed until the material is ready for the oven.

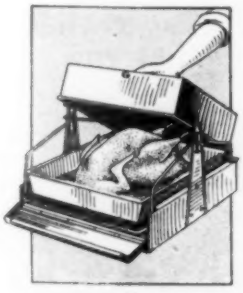


Bread-Raising Cabinet for Home Use

Furnishing a large number of hooks upon which to hold clothing, a rotary garment hanger has been invented which occupies a minimum of space beneath a shelf or on the back of a door. It is suspended from a bracket which holds it free from the wall, while the hooks are arranged on a circular frame which may be turned easily.

Clothes Hanger Fits Small Space

Designed to be used on the top of a stove or burner, a combination roaster, steamer, warmer, and toaster has been made. It consists of a box-shaped utensil fitted with a grating upon which a pan is placed when meats are to be roasted. When steaming is to be done, water is placed in the bottom part.



Roaster Also Used as Steamer and Toaster

An inexpensive apparatus which makes a percolator out of an ordinary coffeepot is built of aluminum and consists of three drippers nestled into the shape of a can that fits into the top of an urn. Coffee may be prepared in this just as in other percolators and without permeating a kitchen with aroma.

Apparatus Makes Percolator of Ordinary Coffeepot

Constructed of rubber and lined with cloth, a bucket which, when not in use, folds flat, is being made for the use of motorists. It holds a gallon and a half of water, and does away with the necessity of carrying a funnel for filling the radiator, as it is shaped to pour its contents easily.

Rubber Bucket Carried Easily by Motorist

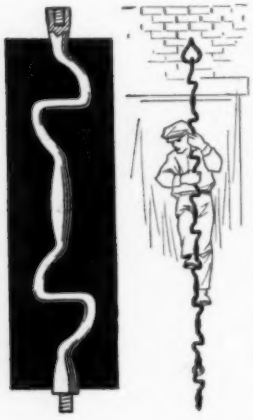
Capable of being packed into a carrier, 28 in. long and about 18 in. high, a portable kitchenette, which includes a folding gasoline stove and enough table and cooking utensils for six persons, is made for the benefit of motorists. The case is constructed of steel or enamel ware and, although compact, has places for carrying bread, sugar, salt, coffee, and similar things necessary in the preparation of a meal.

Complete Kitchenette for Motor Car

Owing to the growing use of gas stoves the traditional London fogs have been greatly diminished.

NEW FORM OF LADDER HAS BUT A SINGLE ROD

A New York inventor has constructed a ladder with but one rod, instead of the familiar form. The novel construction saves space, permits the ladder to be used as an ornamental fire escape, or auxiliary to other fire escapes, or on poles, chimneys, steeples, or gas tanks, wherever, in fact, a scaling ladder can be used to advantage and economy of material is desirable. The ladder, which is of metal, and patented, is built in sections, each section consisting of two steps, a right and a left, with a handhold between. These sections have threaded joints permitting indefinite extension, and the ladder may be attached to the wall by ringbolts at suitable intervals.



NOVEL NUTCRACKER FRENCH INVENTION

A new idea in table novelties is shown in the invention of a Frenchman which affords an easy and convenient method of cracking such nuts as are served at dinner. By an arrangement of levers, sufficient force is applied to the shell of the nut to break it quickly with little effort. Any size nut ordinarily used as a dessert may be readily cracked by this device.

PANAMA CANAL OPENED TO LIGHT-DRAFT VESSELS

The official announcement by the Secretary of War that the Panama Canal would be opened from the Atlantic to the Pacific on August 15, 1914, for commercial vessels drawing not more than 30 ft. of water marked the practical completion of the canal, although the formal opening will not occur until March, 1915. It is expected that in future the canal will be operated without interruption, and announcements will be made from time to time as it is made ready for vessels of greater draft.

A TIN CASE FOR A SILVER DOLLAR

A Texas concern is using a jacket of thin tin fitted snugly about a silver dollar to carry an advertising message to the trade. The little case is shaped like the dollar and covers the coin for a distance of one-quarter of an inch from the rim all the way round, but leaves the face of the coin exposed. On the opposite side a ring-shaped piece, having a band across the coin from rim to rim, is provided, which clamps on the dollar tightly, locking the two parts together. The case bears appropriate legends, advertising slogans, together with the name and address of the merchant using the device.

SPONGE FISHER NEAR RIVAL OF SUBMARINE BOAT

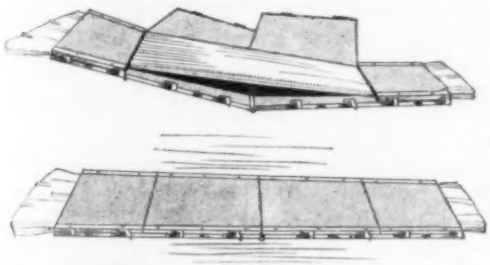
Without diving armor or any means of protection against water pressure, a Greek sponge fisher recently dived to a depth almost as great as that reached by the submarine boat, "F 1," which pushed its way 283 ft. below the water's surface in 1912. The feat,

which is claimed to be without a single precedent, was accomplished when the diver was employed by the Italian naval authorities to recover an anchor lost from a battleship in the Ægean Sea. This rested at a depth of 252 ft. The Greek by mistake once swam into a still deeper place, going down 262½ ft. His task was to place a cable around the heavy weight in order that it might be hoisted aboard the ship.

In all, he made 21 plunges, descending by clinging to a rope tied about a 33-lb. stone. Once he remained under water 215 seconds, although it is possible for him to hold his breath in the atmosphere only 40 seconds.

STRETCHING AND PRESSING CLOTHES BY NEW DEVICE

Men who are particular about the appearance of their clothing find that repeated pressing at the hands of tailors tends to make the surface of the fabric shiny. This objection may be overcome by the adoption of a device recently patented, by which trousers may be pressed and stretched without injury from hot irons. The contrivance consists of jointed sections of veneered wood, so arranged that both ends of the trousers may be inserted and firmly held by clamps. In so doing, the wood sections are sprung into line, bringing considerable force into play, thus stretching the trousers lengthwise, and producing a desirable crease without the objectionable friction which removes so quickly the newness and freshness from fine woolens. The device may be folded up and carried in a bag or suitcase.



Trousers Presser Which Insures Fresh-Appearing Apparel Overnight

MOUNTED CUSHION SAVES KNEES IN SCRUBBING

For use in scrubbing large floor areas, or doing similar work which requires a person to remain in a kneeling position, a cushion car mounted on casters has been made. It is easily propelled by a slight push of the hands on the floor, furnishing a comfortable and dry rest for the knees, and may be moved about at will. A rim of sheet iron around the front and two sides of the rest keeps the knees together.

Rest for Knees While Scrubbing Floors

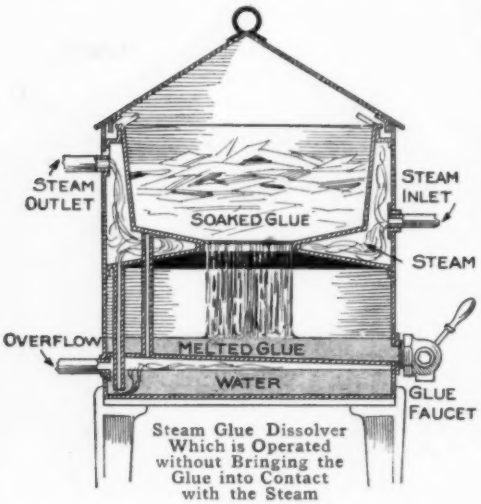
SMOKELESS-POWDER FUMES VISIBLE THROUGH GLASS

As a result of experiments which have been conducted by the Bureau of Ordnance of the Navy Department, a colored glass has been found which renders the fumes of smokeless powder visible. This discovery makes it possible to locate the position of rifles which otherwise might be completely hidden from view. It has the effect of removing the protection which has been afforded the sharpshooter and exposes him to a return fire. The discovery is considered of the utmost importance, and information concerning the details of the glass is not being made public by the department.

¶ Motion pictures of forest fires were shown at the 1914 meeting of the American Forestry Association.

AN INSTANTANEOUS GLUE DISSOLVER

Patents have been applied for on a device for quickly dissolving glue without contact with steam, and for



Steam Glue Dissolver Which is Operated without Bringing the Glue into Contact with the Steam

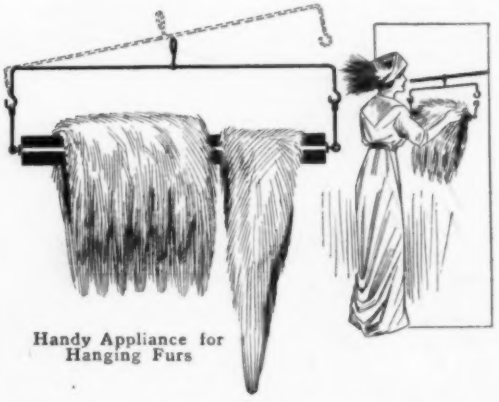
retaining the liquid in condition for immediate use. A sheet-metal cabinet of circular form is provided, adapted for connection with a low-pressure steam supply. A copper pan with a brass-wire sieve at the bottom, fits over a copper retaining vessel, having a faucet at the lower edge. Soaked flake glue is put into the removable pan and the cover replaced. Immediately upon turning on the steam, which circulates about all sides of the dissolving pan, the glue commences to dissolve, dripping through the fine wire mesh into the retainer beneath, where it is kept liquid by the heat from the steam.

USING KEOKUK DAM TO MAKE TIDAL WAVES

Making artificial tidal waves and measuring their effect at different points is the feat accomplished by government engineers in an attempt to determine what effect, if any, the big Keokuk dam is having on navigation in the Mississippi below the dam. These measurements were in the nature of laboratory experiments, with the biggest river in the country and one of the biggest dams in the world pressed into service as laboratory apparatus, and the data obtained are expected to be of the greatest service in estimating the effect of such waves under other conditions. The Keokuk dam consists of 119 spans, each equipped with a gate for controlling the water. In each experiment a number of these gates, selected to produce an even flow over the full width of the river, were opened suddenly with the result that a wave from 2 to 6 ft. high was started down the river. Measurements made with recording instruments showed that the highest waves flattened out to the normal level of the river at a point about 40 miles below the dam, while the smallest waves disappeared within a few miles.

HANGER FOR FURS MADE EASILY AT HOME

Every woman knows that furs should not be folded nor hung over a sharp edge, and a recent invention by a Frenchman points the way to care for furs without very much trouble or expense. A roller with a large diameter is provided with end pieces of wire terminating in a ring. A wire hanger which engages these rings and



Handy Appliance for Hanging Furs

having a hook by which it may be hung in a closet or upon a support in a display window completes the device.

HIGH-POWER BOMBS FOR NAVY AIRMEN

A recent series of experiments in which bombs of high explosive power were hurled from an aeroplane has demonstrated the feasibility of this method of attack to the satisfaction of the Navy Department. The experiments were conducted at the naval proving grounds at Indian Head, Md. The bombs were dropped from various heights, up to 1,400 ft., by the aeroplane "AB 4," operated by Lieut. B. L. Smith, U. S. M. C., with Lieut. V. D. Herbster, U. S. N., assisting.

Navy officials will not divulge the nature of the explosives used nor the types of bombs employed. It is officially stated, however, that the bombs were made by a private manufacturing concern at the direction of the navy ordnance experts. A number of experiments have been conducted by the navy to test the accuracy with which bombs can be hurled from aeroplanes, but the attention of the department is now directed to the study of explosives. Unless a bomb can be manufactured that will inflict great damage on any vessel or fortification on which it is dropped, the value of the aeroplane in warfare will be greatly lessened. Most of the previous experiments have been at comparatively low altitudes. It is now realized that if bombs are to be used, they must be dropped from altitudes that will place the machines and operators out of the range of gun fire from vessels or fortifications. Unknown air currents which serve to deflect the course of the projectile are encountered when the bombs are dropped from these high altitudes and greatly reduce the chances for a "hit." For this reason bombs of considerable weight must be employed if accuracy is desired, since light-weight projectiles are subjected to greater deflection by air currents than those of heavier construction.

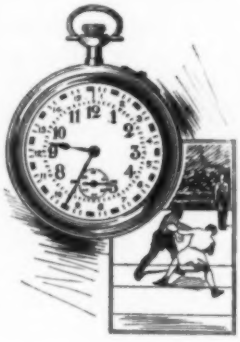
¶An elevator on the Manchester ship canal is capable of transferring 375 tons of wheat an hour.

SELF-DRAINING ALUMINUM KETTLE

A draining valve in the bottom of an aluminum kettle, which appeared on the market a short time ago, does away with the dangerous task of pouring hot water off boiled potatoes and vegetables. The valve, in the center of the bottom, is made up of a circle of holes and closes like the lid of a pepper box. The handle which operates it extends through a hole in the lid of the kettle, so that the kettle can be held over a sink and drained by a turn of this handle.

STOP WATCH DESIGNED FOR BOXING CONTESTS

A stop watch for the use of timekeepers, umpires and officials in boxing contests, which is designed to record the minutes, rests and rounds, has just been invented. Upon a special dial, two sets of minutes are shown, the outer ring showing three-minute rounds with one-minute rests in black, between. The inner circle has the usual arrangement of hours and minutes designated. When the contest begins, the stop is set when the second hand is at 60, the minute hand being placed at the long mark at the top of the watch. Upon the sounding of the gong, the official pushes the slide on the side of the watch, and the timepiece will tick off the exact rounds in due course.



ALARM CLOCK TURNS ON STREET LIGHTS

The street lights of Leetonia, Ohio, are controlled by a time switch, operated by an alarm clock. Firmly attached to a shelf the clock has a circular piece of metal soldered to the alarm-winding key, which winds a cord about it as the alarm rings. This serves to pull a knife switch, allowing a weight to fall from another shelf, and so jerks a rope and trips the circuit breaker. By attaching the hook at the end of the rope to either side of the circuit breaker, the lights may be lighted or extinguished as desired, at any predetermined time.

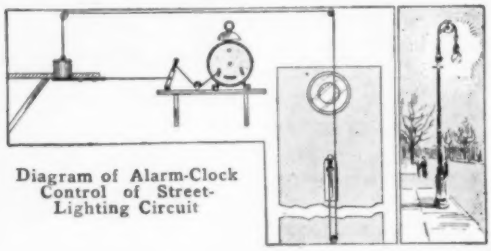
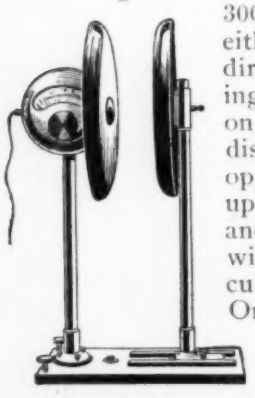


Diagram of Alarm-Clock Control of Street-Lighting Circuit

NEW VOLTMETER MEASURES 300,000 VOLTS

A new voltmeter has been invented which registers tensions as high as 300,000 volts on either alternating or direct currents, giving a direct reading on the scale. Two disks are mounted opposite each other upon glass supports and connected to wires from the circuit to be tested. One disk contains a movable plate designed to receive the attraction from the opposite disk. When the current is turned on, the attraction pulls the small movable plate, revolving a pointer over a scale, thus measuring the amount of attraction and recording the number of volts. The second disk, behind which the small movable plate operates, is a guard disk only. The first disk is so mounted that the support can be slid along grooved rails on the base, to increase the distance between the disks as higher tensions are used. Each movement of the disks toward or away from one another affects the recording device so that a different base for the scale has to be established at each distance.

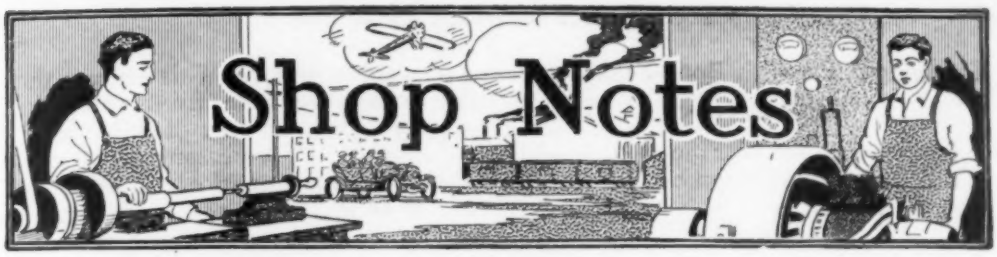


MAGNETIC LOCK SECURES DOOR OR RAILING

A novel electromagnetic lock has been patented by a Frenchman for use on doors or gates which it may be desired to open from a distance. The core of a solenoid constitutes the locking bolt and it may be operated by pressing a button or by a switch. This lock requires no key, and the operating button may be concealed somewhere in the casing of the door, or on a desk in the reception room of an office, or elsewhere as desired.

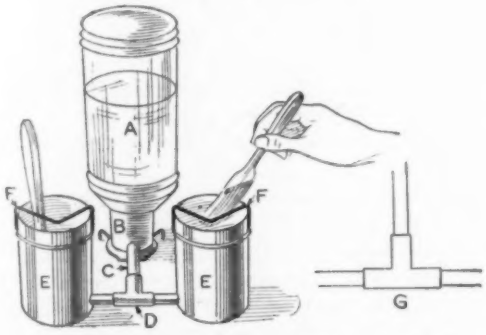
NONBURSTABLE INNER TUBE SHOWS GREAT STRENGTH

A nonburstable inner tube for use in motor-car tires was demonstrated recently at New York where tests showed it possible to use worn-out casings without a blow-out resulting. Twelve taxicabs were employed and the new inner tubes placed in shoes which either were torn or purposely cut so that the tubes were exposed. The tires were inflated as if the cases were new, and the experiment showed the tubes to be of remarkable strength. The claim made is that with them every bit of wear there is left in an old shoe may be utilized.



Fountain Mucilage Can

Any handy person who has a soldering outfit can construct a fountain mucilage can out of a regular mucilage pot or ordinary preserving jar, some tin cans, and several pieces of brass or iron tubing. Make a suitable opening in the tin cover of the jar A, and solder onto it a small can, B, or short cylinder, open only at the end connecting to A, but having a hole near the closed end suitable for attaching a square or round pipe, C. This is soldered to the cross pipe D, which should have a hole in the center to fit C, so that any mucilage from the jar A is free to pass through B and C and flow out at the ends of D. A simple way of making connection for C and D is to use an ordinary pipe tee with the pipes screwed into it as shown at G. The brush cans E are punctured near the bottom to admit pipe D and then soldered to it. This practically completes the fountain. The wires F may be

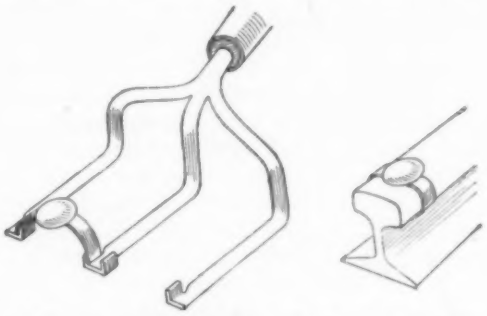


The Small Cans will be Kept Filled to a Certain Level at All Times

soldered to the cans E for the purpose of brushing off any surplus paste. Coating the cans, wire, and brush handles with paraffin tends to keep them cleaner.

Torpedo Fork for Railway Flagmen

The device shown in the sketch is known as the torpedo fork. It allows a person standing on the rear end of a



Fork for Holding the Spring of a Torpedo to Place It on a Rail behind a Train

train to place torpedoes on the rail while the train is in motion.

The tines are spaced wide enough apart and are so shaped that the rail head will pass up between them. The ends of the tines are flattened and bent as shown, while the whole fork is fastened in a handle of suitable length.

In operation the torpedo spring is opened and slipped over the clips on the tines. The fork is then lowered over the rail. When the torpedo strikes the rail it is knocked off the clips, and the spring grasps the rail head.

These forks can be made single if desired, but the double fork is more convenient where it is required to set two torpedoes close together.—Contributed by Clyde L. Adams, La Grange, Ill.

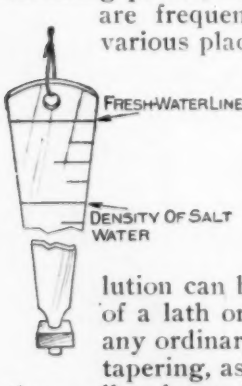
¶A help in starting an automobile motor in cold weather is to soak a rag in hot water and wrap it around the carburetor and intake manifold.

Speaking Tube with Both Transmitter and Receiver

It was necessary for me to communicate with the workmen on the second floor at times, and I was compelled to go up, as there were no telephone or speaking-tube connections. Knowing it was useless to ask for material, I found some old pieces of pipe in the scrap and connected them up to make a speaking tube, as shown in the illustration. The transmitting mouthpiece at each end was made of a tin funnel soldered in a nipple which was turned into the side outlet of a tee fitting, and the receiver consisted of a funnel attached to a piece of rubber gas tube fastened to the end of the tee. This made it possible to listen and talk the same as with a telephone. Rapping on the pipe in one room could be plainly heard in any part of the other one.—Contributed by J. O. McDonnell, Toronto, Can.

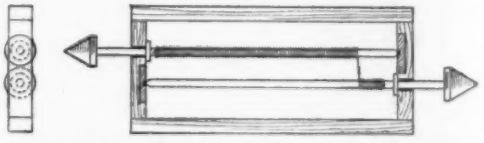
Gauge for Determining Density of Salt Water

For protection against fire in manufacturing plants, barrels of salt water are frequently set around in various places. If the brine be of sufficient density, freezing of the water will be prevented in cold weather. A handy gauge for determining the density of the solution can be readily made out of a lath or strip of wood and any ordinary nut. Cut the lath tapering, as in the sketch, with the small end rounded off to fit the nut securely. The stick should be cut off a little longer than the depth it will sink to in fresh water. This should then be marked for the fresh-water line, after which it may be placed in a salt solution of the necessary density and the depth again marked. The loop of string at the upper end is for carrying it. If the gauge is to be used frequently, it would be better to varnish it, to insure against water-logging.—Contributed by M. Clogston, Terre Haute, Ind.



Homemade Revolution Counter

For average accuracy and speed the revolution counter shown in the illustration will serve as well as a manufactured article. It consists of a wooden frame of convenient and sufficient width and length to contain two wire spindles. These should be made of stiff wire, pointed at one end and provided with a centering plug at the other. Solid-metal washers are fitted in the frame and countersunk slightly to serve as bearings for the pointed ends of the spindles. Holes are drilled at the opposite sides of the frame to allow the spindles to pass through easily. In order to hold the spindles in place with sufficient stiffness so their momentum will not cause them to revolve after the frame is removed from a rotating shaft, collars are provided and held in place by soldering, or with pins placed through holes drilled in the spindle. At one end of each spindle a hole is drilled for fastening the end of a thread so that, when assembled, the holes will be at opposite ends of the frame. A strong, fine thread of sufficient length to produce a large number of turns is fastened to the spindles and wound up. If too much string is used, the coils will be too close together. It is advisable to put on sufficient string so that the



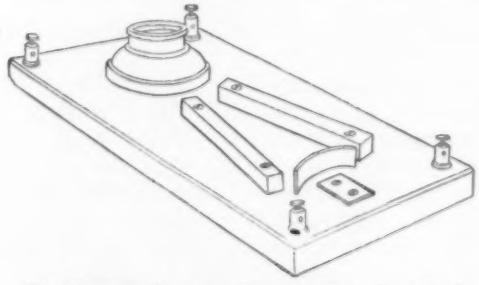
A Homemade Revolution Counter or Speed Indicator for Finding the Speed of Shafting

total number of coils is divisible by 10. When using the counter, the exact number of coils on each spindle must be known before starting; it is therefore best to start with one full spindle and the other empty. The length of time required in getting the speed will be determined largely by the number of coils available. If the speed is high the spindle will be wound up rapidly and a short time must be figured on, or the spindle will wind up all the available thread and break it at the end. Full minutes, or convenient fractions thereof, should be used in taking the speed. The tedious work comes in counting the coils. This can be partly overcome by placing a small knot on every tenth coil. It will then only be necessary to count the knots, multiply that number by ten and add the several coils wound up outside of the last knot.—Contributed by P. A. Baumeister, Easton, Pa.

How to Make an Electric-Fuse and Lamp-Trouble Tester

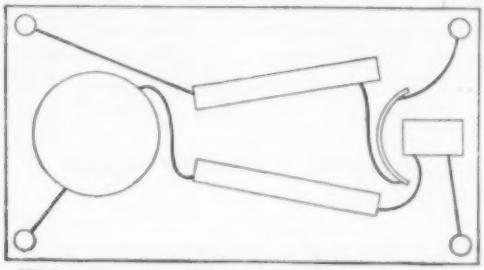
A great many good fuses and electric globes are thrown away for the simple reason that there is no device for testing them out. The sketch is descriptive of a simple device for testing plug fuses, inclosed fuses, opens in circuits, and incandescent lamps.

The base is made from a piece of insulating material, such as slate or, preferably, a composition that is not easily broken, approximately 8 in. long, 5½



The Parts as They are Located on an Insulated Base to Make a Trouble Tester

in. wide, and ⅝ in. thick. Four binding posts, with back connections, are mounted in the four corners, as shown. The screws fastening these binding posts in place are countersunk on the under side, and a washer is provided under the head



Wiring Diagrams Showing Manner of Connecting the Parts from the Back of the Base

of each screw. A lamp receptacle is mounted on the face of the base, in the center and near one end, as shown. Two pieces of brass, ⅜ in. square and about 4 in. long, are mounted on the base by means of suitable screws with their upper ends closer together than their lower ends. A piece of thin sheet brass is bent into a curved form and mounted on the lower end, and a small piece of strap brass is mounted inside of the curved piece, as shown.

The various parts of the device are connected as follows: Starting with the upper left binding post, connect it to the terminal of the socket; connect the other terminal of the socket to the left piece of brass, and from this to the piece of brass in the center of the curved piece at the lower end of the base; thence to the lower left binding post. The upper right binding post is connected to the right piece of brass, then to the circular piece of brass and to the right lower binding post. The wires used in making these connections should be imbedded in grooves cut in the under side of the base. Place an ordinary 110-volt lamp in the receptacle and connect the two upper binding posts to the source of current and the device is complete.

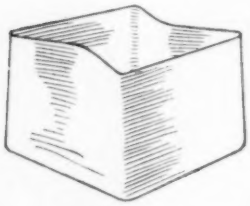
Lamps and plug fuses may be tested by placing their two terminals in contact with the curved piece and flat piece mounted in its center. If the circuit through the fuse, or lamp, is complete, the test lamp at the upper end of the board will glow, and the de-

gree of its illumination will depend on the amount of resistance introduced in the circuit. Thus, if a lamp of the same kind and candlepower as the test lamp is being tested, both will be subjected to one-half its normal voltage, while a fuse will introduce practically no resistance in the lamp test, and it will burn up to the full candlepower if the fuse is good.

Inclosed fuses may be tested by placing their terminals in contact with the two strips of brass set in a V-shape. Flatirons, electric heaters, motors, etc., can be tested by connecting them to the two lower binding posts.

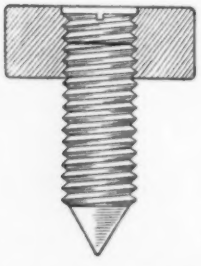
Replacing Paper-Box Covers

The replacing of a cover on a paper box is not easy, especially if it contains small heavy articles, such as screws or small nuts. Many articles in the hardware trade are put up in these boxes. A little trick that will enable anyone to quickly cover the box is shown in the illustration. Push inward slightly on the sides of the box to bend them in, as shown, and the cover will slip on easily.



Fastening Fiber Knobs to Screws

A number of small adjusting screws, with fiber knobs securely fastened to them, were required, and, as they were to be used on high-tension electrical apparatus, it was, of course, out of the question to secure the knobs to the screws in the usual manner with a pin driven through the fiber and screw, as this would present an uncovered metal part where a shock could be received through the hand.



After some experimenting, I hit upon the following plan, which was to drill and tap a hole through the center of the fiber knob and turn the screw in about two-thirds of the way. Setscrews of the proper size were procured and one of them was turned down on the screw in each knob. The setscrew was allowed to sink below the surface of the knob. The recess thus formed was filled with a highly insulating compound.—Contributed by G. N. Garrison, E. Orange, N. J.

Paper Stencils

As I had a job of numbering some benches and was unable to make the figures neatly, I thought of cutting some stencils, but had no numbers to draw the outlines. In looking among the things stored in my desk I found an old calendar pad and from this I cut out the figures in stencil form, which served the purpose as well as regular stencils. A brush, cut short, and some thick paint were used.—Contributed by Chas. D. Morgan, Dayton, O.

A Twine Cutter

A very simple twine cutter can be made from a common screw-hook, by filing the inner side of the curved end to a cutting edge. With the hook screwed into a convenient place, the twine may be cut easily by drawing it over the sharp edge.—Contributed by U. B. Gilroy, Marysville, Cal.

How to Make an Aerial Propeller

By JOE V. ROMIG

A great difference of opinion in designing the various parts of an aeroplane seems to exist regarding the proper construction of the propeller. No one propeller will work equally well for all cases. In the following description will be given the approximate formulas and proportions of propellers suitable for driving homemade gliders, canoes, and wagons, together with a method of constructing them.

The principle of a propeller action may be compared with that of a bolt turning in a nut, the turning bolt acting as the propeller while the stationary nut takes the place of the air. In actual practice, only a small section of the bolt A, Fig. 1, is taken. In order to balance this section, an exact duplicate of it is set on the opposite side, thus forming the two-bladed propeller of Fig. 2.

The "pitch" of a propeller can be best explained, by referring to Fig. 1, as that distance through which the bolt would move in a lengthwise direction during one turn, or equal to the distance B.

In the case of the bolt and nut every turn, no matter how slight, will move the bolt lengthwise a corresponding amount. It hardly need be mentioned that the propeller cannot act in the same way, due to the yielding nature of the air. The difference between the distance a propeller would move through, theoretically, and the distance it actually moves forward, is called its "slip." In the bolt and nut no slip occurs; in water the slip may be as low as 20 per cent, but in air it is greater, averaging about 50 per cent, or, in other words, the propeller theoretically covers twice the distance it actually passes through. Slip will vary with the design and care in the construction of the propeller. Some well-known makes have reduced the slip to 25 per cent.

By "thrust" is meant the amount of push or pull that a propeller can exert. It is frequently given in pounds per engine horsepower, varying with the different designs of propellers. A fair average value may be taken as 10 lb. per horsepower; thus, if it required a

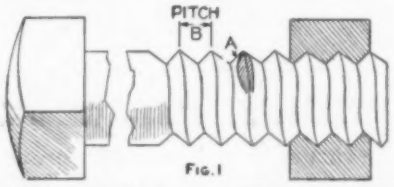


FIG. 1

Relation Existing between the Pitch of an Ordinary Bolt Thread and That of a Propeller Blade

pull of 20 lb. to draw a wagon at a rate of five miles per hour, the engine horsepower to drive the same wagon with a propeller would be $20 \div 10$, or 2. For driving an aeroplane, an average thrust equal to $\frac{1}{6}$ the total weight can be assumed; thus, for a 1,500-lb. machine a thrust of $1{,}500 \div 6$, or 250 lb., is required. Knowing the amount of thrust, the necessary theoretical engine horsepower may be figured from the following formula:

$$\text{Hp.} = \text{thrust} \times \text{speed in feet per hour} \div 60 \times 33{,}000 \quad . \quad . \quad . \quad . \quad . \quad (1)$$

For a biplane a speed of about 30 miles per hour is necessary to raise it off the ground; in a monoplane the speed must be greater. Assuming a machine of 1,500-lb. weight, requiring

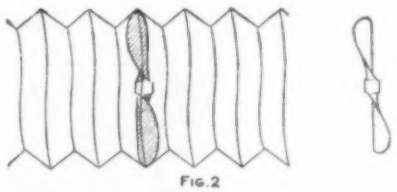


FIG. 2

A Two-Blade Propeller and Its Similarity to the Threads of a Double-Threaded Bolt

a thrust of 250 lb., and traveling at a rate of 30 miles per hour, the necessary theoretical engine power would be found by substituting in the above equation, as follows:

$$\text{Hp.} = 250 \times 30 \times 5{,}280 \div 60 \times 33{,}000 = 20;$$

but assuming losses in engine friction

and transmission to propeller of about 50 per cent, the actual horsepower would have to be double, or 40.

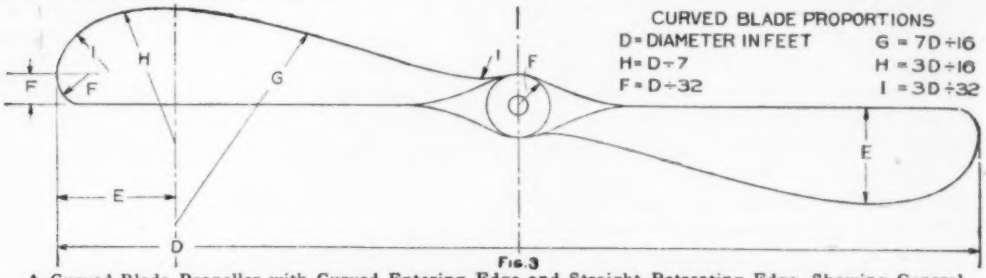


FIG. 3

A Curved-Blade Propeller with Curved Entering Edge and Straight Retreating Edge, Showing General Proportions Used in Designs Suitable for Propelling Homemade Gliders, Boats, and Ice Boats

The thrust available with a propeller may be approximately found by this formula:

Thrust $= .0019688\ D^2 \times V^2$. . . (2), in which D equals diameter of propeller in feet, and V the velocity of the air leaving propeller, which, in turn, is equal to the pitch of the propeller in feet times its revolutions per second, times the efficiency of the propeller. The second equation can also be written:

$D^2 = \text{desired thrust} \div V^2 \times .0019688$ (3),

hence $D = \frac{1}{V}\sqrt{\frac{\text{Thrust}}{.0019688}}$.

The diameter of a propeller is limited by its peripheral speed or the linear distance the extreme outside edge would travel. The peripheral speed, ordinarily taken, varies from 12,000 to 40,000 ft. per minute. Assume a speed

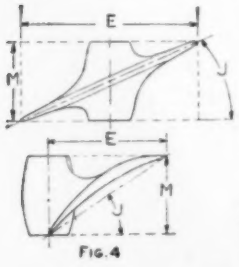


FIG. 4

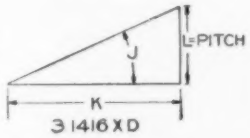


FIG. 5

Method of Determining the Angle a Propeller Blade Makes with the Center Line of the Shaft

Difference between a Flat-Blade and a Curved-Blade Propeller, Showing Method of Obtaining Thickness of Hub

of 20,000 ft. per minute and an engine speed of 1,000 revolutions per minute, then the diameter of propeller can be figured as follows:

$D = L \div 3.1416 \times \text{R.P.M.}$ . . . (4), where L is the assumed linear speed of the propeller tip, and R.P.M. the revolutions per minute of the propeller (or engine, if direct-connected). Hence

$D = 20{,}000 \div 3.1416 \times 1{,}000 =$ 6.4 ft.

For any desired speed, the necessary pitch, P, of the propeller can be determined by the following formula:

$P = M \times 5{,}280 \div 60 \times \text{R.P.M.} \times E$. (5), where M equals the actual distance covered, in miles per hour; R.P.M. equals the speed of the propeller in revolutions per minute, and E equals the efficiency of the propeller; that is, the ratio of the distance the propeller actually moves forward to the distance it theoretically would move forward if there were no slip.

In the example of the speed of 30 miles per hour for the aeroplane, and an efficiency of 50 per cent at a speed of 1,000 R.P.M. for the propeller, the pitch would be

$P = 30 \times 5{,}280 \div 60 \times 1{,}000 \times .5 =$ 5.28 ft.

With the diameter and pitch of the propeller thus figured, the thrust could be found by substituting in the second formula:

$\text{Thrust} = .0019688 \times 6.4^2 \times (\frac{1{,}000}{60} \times 5.28 \times .5)^2 = 156$ lb.

But as this thrust is smaller than originally figured, a larger diameter and higher speed must be taken.

The engine horsepower necessary to drive the propeller can be determined by substituting in the first formula:

$\text{Hp.} = 156 \times 30 \times 5{,}280 \div 60 \times 33{,}000.$

Since there are many different designs for propellers, general proportions may be assumed as given in Fig. 3.

How to determine the thickness of the hub parallel with the direction of the shaft will be described later on.

In the simplest but least efficient propellers, the blades can be made flat instead of curved. In the flat blade, the angle J, Fig. 4, is determined as in Fig. 5. Lay off a distance, K, equal to 3.1416 times diameter of propeller in feet. The distance L is laid off at right angles to K, and is equal to the pitch of the propeller in feet. Having decided on the width, E, of the blade, the thickness of the hub M, or necessary thickness of block, may be found by laying off the triangle, as in Fig. 4. In a flat-blade propeller, one-half is usually placed on each side of the center line, as in Fig. 6. In a well designed propeller, the blade changes its angle from tip to hub and is also curved to correspond to a theoretical screw.

In Fig. 1 it is seen that every point of the bolt must move exactly the same distance in a lengthwise direction for any rotation. A point on the outside of the bolt will move through that distance by passing through a large circle; a point at the bottom of the thread will have a much smaller and sharper

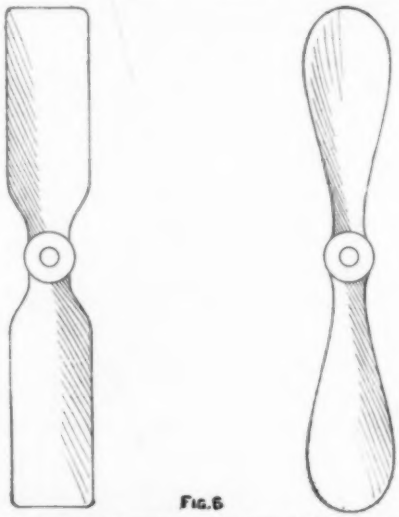


FIG. 6

A Flat-Blade Propeller with Straight Edges, and the Same with Curved Edges

curve to pass through, while a point at the center of the bolt would simply move in a straight line, parallel with the axis. In other words, due to the pitch remaining the same, the blade angle should increase from tip to hub. This angle, for various points on the propeller, may be determined as in

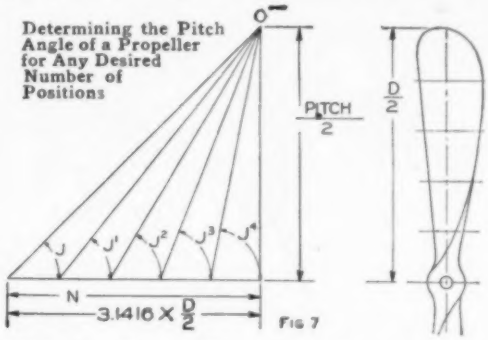


Fig. 7. Lay off a distance equal to 3.1416 times one-half the diameter of the propeller; at right angles to this line draw one equal in length to one-half the pitch, then by connecting the two ends of the lines thus drawn, the required tip angle is determined. Any number of blade sections may be determined by dividing one-half the blade into the desired number of equal parts, dividing the length N into the same number and connecting these points with O; the angles indicated by J, J^1, J^2, J^3, etc., are the required angles of the blade curve. To these values should be added small and regular increases from 2 deg. at the tip to about 5 deg. at the hub, to increase the efficiency of the propeller.

If the propeller is to be made out of one piece of wood, select a piece with the grain as straight as possible and from a strong wood that can be shaped with a drawshave, such as poplar or spruce. The desired shape of propeller should be laid off on the block of wood and cut out. Templates of cardboard should be made corresponding to the required angles, as found in Fig. 7. After laying off the required distances from the center on each side of the blade, notches should be cut at an angle exactly corresponding to the templates, as at J, Fig. 8. Then the shaping can be done, starting at the hub and working toward the tips, being careful at all times of the grain, so as not to split the wood. Fig. 8 represents the blade

with one side beveled off. This should then be given the proper curve as represented by Fig. 9.

With the front side finished, the back

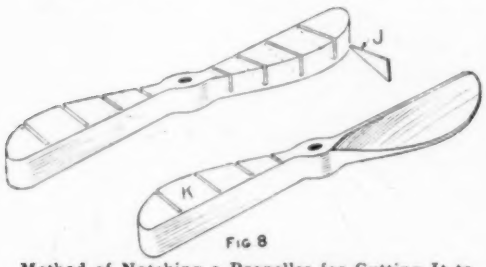


FIG 8

Method of Notching a Propeller for Cutting It to Shape, and One Blade Shaped

side may be shaved off and the thickness calipered frequently by means of outside calipers. The blade should come to a rather sharp edge on the straight, or retreating, edge; the thickest portion should be at about one-fourth the width of the blade from the entering, or curved, edge. The blades in a propeller must be as nearly alike as is possible to make them, in order to prevent vibration.

After the blades have been cut to shape, they should be scraped and sandpapered. To prevent splitting, especially with soft woods, a fine strong cloth should be glued over the surface.

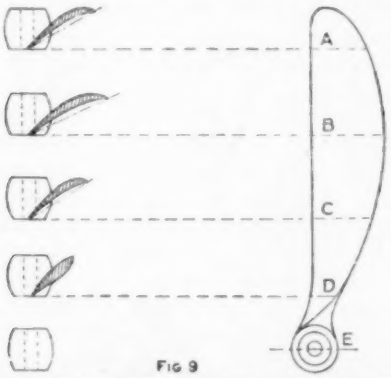


FIG 9

Propeller Blade and the Plan View, Showing Shapes of Blade at the Different Points in Sections

The efficiency of the propeller can be improved by giving it several coats of varnish, evenly put on, thereby reducing the skin friction.

¶To set cutting tools in a moving machine is exceedingly dangerous.

Taper-Shank Drills Used in a Chuck

In the machine shop of a felt mill several miles from town only straight-shank drills were used, because they were easily obtained in the small town. One day the errand boy brought back six taper-shank drills, and some of them had to be used immediately.

The one lathe in the shop was a small affair with a solid tailstock, and we had no way of boring a taper hole, but as there was no time to send the drills back for exchange, we made sockets interchanging with the straight shanks in the following manner: Copper wire was wrapped around the drill shank, that had been previously rubbed with black lead, one layer deep, the size being about that of ordinary wire used for baling hay. The wire was tied with fine wire, to hold it in place, and then dipped in soldering solution.

A straight hole was bored through a block of wood, the wrapped drill shank placed centrally in the hole, tang down, and the lower end was packed with clay, whereupon melted hard solder was poured in around the drill shank. When cool, the shank and its copper-and-solder socket was removed from the mold by splitting the wood.

A hole was then drilled through the side of the socket and part way into the drill shank, to make a good countersink, and the hole threaded. A setscrew was used in the hole to clamp the drill in the socket. The whole collet was then turned up in the lathe. No attempt was made to drive the drills by the shanks; they were driven with the setscrew.—Contributed by J. B. Murphy, Plainfield, N. J.

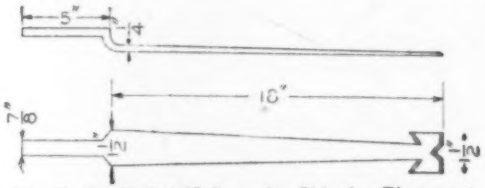
Preventing Noise on Automobile Drive Chains

A customer came to a shop one day with an automobile having a set of extremely noisy drive chains, the noise being caused by the chains slapping on the sprocket teeth as they came into mesh. The following simple repair eliminated this trouble: A strip

of leather, of such thickness as to barely touch the chain, was fastened on the circumference of the brake drum. Each chain link touched the leather lightly as it engaged its proper tooth, and in this manner the noise due to the contact was muffled to a considerable degree, and the result was a very quiet set of chains.

Tool for Removing Shingles

When, in repairing old roofs, shingles must be removed without disturbing others surrounding them, a shingle hook made as shown in the sketch is a handy tool to use. The shape of the shank end is such that it can be driven in either direction. The edges of the notches are sharpened for cutting the nails. The tool can be used to cut nails holding shingles below



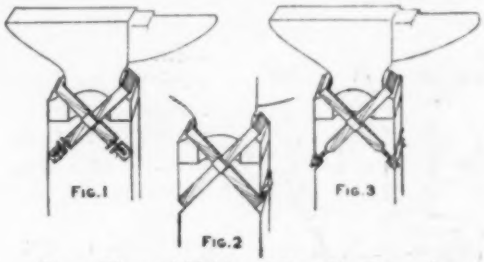
The Tool will Cut Nails under Shingles That must be Removed and Replaced with New Ones

others that need not be removed.—Contributed by Otto V. Vaughn, Belfast, Maine.

Fastening an Anvil to a Block

When it is necessary to fasten an anvil to a block one common way is to spike it. The spikes soon work loose and usually do not hold very well after that. One device for making an adjustable fastening is given in Fig. 1. It consists of two U-shaped bars, strapped around the anvil at each end. The ends of the bars are bent at right angles and drilled to receive bolts, which, by means of strong spiral springs, connect the straps with similarly bent pieces fastened to the block. Any wear or vibration of the anvil is thus automatically taken up by the springs.

Additional means of securing anvils are shown in Figs. 2 and 3. In Fig. 2 the fastening consists of closed loops fitted to pass around the anvil and block. The loops may be of whatever



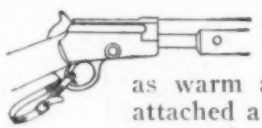
Three Ways of Making Adjustable Straps for Fastening an Anvil to Its Block

length required, and should be hung in place around the anvil when this is ready to be set on the block. The loops are driven into place in notches previously cut in the block at the proper distance. Any looseness, or adjustment for wear, can be taken up by driving wedges between the block and loops.

In Fig. 3 is shown an adjustable fastening consisting of two U-shaped bars with round rods welded on the ends, which are threaded for standard nuts. Cross bars of sufficient width to extend beyond the sides of the block are drilled for the threaded ends of the U-straps. When fastening the anvil on the block, the straps are put in place, the bars slipped over the threaded ends, and the nuts put on. Any adjustment for wear can be readily made by simply turning the nuts.—Contributed by James Hughes, Mexico, N. Y.

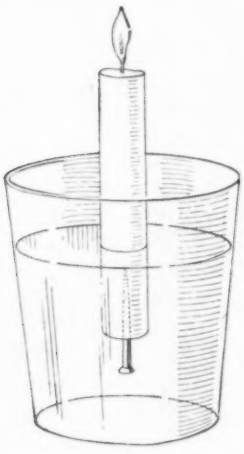
Pulling Gun Trigger with Mitten-Covered Hand

The sketch is descriptive of a method of firing a gun used by myself while out hunting on cold days. Gloves are not as warm as mittens and I attached a strap to the trigger as shown so that I could take hold of it with a mitten-covered hand.—Contributed by Bob Warman, London, Canada.



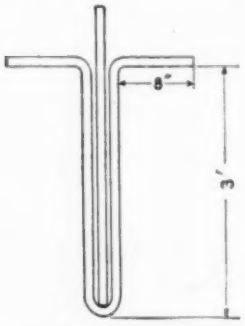
Glass of Water as a Holder for a Candle

In the country where neither gas nor electricity is available, it is often necessary to use a candle for illumination. If it is desired to light up a corner or part of some mechanism and both hands are to be used, a simple holder for a candle can be improvised by inserting a nail in the lower end of it and placing it in a glass, three-fourths full of water. The candle will rise gradually as it is consumed, and no tallow will be spilled on the lighted object.



Holding Irons for Carrying Sheet Metal

Large sheets of metal can only be handled conveniently by hand in a horizontal position, and this is very dangerous, as the fingers are liable to be cut or jammed in passing through doors.



The sketch illustrates a holding device that can be used for carrying the metal in an upright position. The metal in this position more readily keeps its form, so that it may be carried through many places where a great deal of trouble would be experienced if carried in a horizontal position.

The holding irons can be made in any size and strength, to suit general conditions. For convenience and safety in moving any of the heavier forms of unwieldy sheet metal, they are hard to beat.—Contributed by F. W. Bently, Milwaukee, Wis.

Selecting Wood for Making Patterns

In spite of the advance in prices of material and the introduction of cheaper kinds of lumber, pine still retains its position as the leading wood used in the making of patterns, and justly so, for it is soft but not brittle, works nicely under the hand and machine tools, and is not easily affected by atmospheric conditions. These desirable qualities, however, are not characteristic of all pine nor of all boards sawn from the same log. Some boards may possess all these qualities and others not one. The selecting of suitable pine for pattern work should be intrusted to an expert and not left to the judgment of the lumber dealer.

One of the first things to be considered is that the lumber must be perfectly dry, as no matter how good the quality may be, if it has not been kiln or season-dried, the wood is of no value in patternmaking. The boards should be carefully examined on both sides to see that they are free from sap and sap wood, knots, worm-eaten holes, wind shakes, and fancy grain somewhat similar to quarter-sawed oak. The latter is an indication of extreme hardness. The presence of sap is easily discovered, as the board will be very heavy, yellow in color, and in some instances the sap will stand out in little globules on the surface. Sap wood is dead and spongy, and does not work well. It is almost always white in color, but sometimes runs from this to a reddish brown. A board should not be condemned, however, for a little sap wood at the edges, as this condition exists in some very good boards. The same holds good of worm-eaten parts. Some authorities state that the presence of worm-eaten holes is an indication of good lumber, the worms being the best kind of judge, but the usual practice is to discard such boards. A few knots, if they are small and not

loose, will do no harm if the board is otherwise sound, but very few knots are found in the better grades. Wind shakes are those longitudinal slivery splits, which indicate that the log has been subjected to a severe twisting strain in the tree. Boards in which this condition exists are useless and should be avoided.

Two of the best indications of the quality of a pine board are the width and weight. Boards, 14 in. or over in width, are usually of good quality, which improves with the width. This is because the wider boards are from trees of mature growth, nearer the heart and farther away from the outside sap. Such boards will be light in weight, straight-grained and soft, while those from the younger growth will be narrow, hard and heavy, and consequently difficult to work.

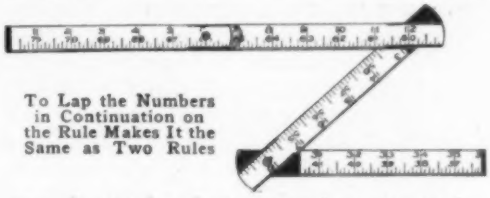
Quarter-sawed boards are cut from the log in such a way that the center line drawn through the thickness would be a radial line cutting the center of the tree. There is little or no shrinkage to quartered stock and, both sides being affected equally by the atmosphere, they do not warp or twist. It is the ideal lumber for delicate patterns that must be made in a single piece. The end of a quarter-sawed board will always show the growth or year-ring marks standing at right angles to the surface.

In selecting pattern pine, one cannot expect to procure it all perfect, even if the stock is picked from that of first quality, but by keeping in mind the points mentioned there should be no difficulty in getting the best the lumber dealer has.—Contributed by J. A. Shelley, Brooklyn, N. Y.

Numbering Inches on a Rule Both Ways

As draftsman in a large automobile-body works, I found the need of a new-style measuring rule that would save time in adding up lengths. For instance, by the addition, or continuation, of the numbers 37, 38, 39, 40, etc., up to 72, on a 3-ft. rule, two rules in one, a 3-ft. and a 6-ft. rule, were obtained.

To use the rule, measure the full length, then over to the point desired;

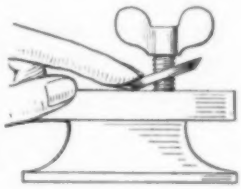


To Lap the Numbers in Continuation on the Rule Makes It the Same as Two Rules

say, for 44 in., just extend to the 44-in. mark. It is always sure and saves the time of turning the rule around and figuring the amount to make 44 in.—Contributed by Frank P. Reidhoar, Connersville, Ind.

Bevel on Washer to Pick It Up Easily

The picking up of a washer on a flat surface cannot be easily accomplished, and when I had several hundred pieces to machine and washers to raise for each piece in clamping them in place, it presented quite a task. I found that, by filing the under-side edge of the washer on a bevel, a slight touch on one side would raise it on the other sufficient to slip the thin piece under it.—Contributed by F. H. Hague, Jr., Chicago.



Soldering-Copper Rest

To prevent a hot soldering copper from touching the surface upon which it is placed, attach a large iron washer to the shank as shown. This will act as a rest and keep the copper raised.

The Washer on the Shank Holds the Heated Copper End Up from the Surface

When doing work on a small space the washer can be slipped up to the handle and held there, then let down to its position for a rest.

Lining Up Shafting

A very simple method of lining up shafting is as follows: The principle is to intersect two planes, the vertical and the horizontal. Proceed to locate the shaft in the vertical plane, then adjust it to the horizontal plane. If the work is carefully done, the center of the shaft in each plane will be straight.

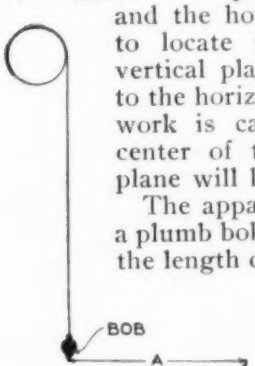


FIG. 1

The apparatus necessary is a plumb bob and cord, a string the length of the shaft, a level and leveling board, and three U-bars, about 5 ft. long.

To adjust the shaft in the vertical plane, stretch the string on the floor parallel with the shaft and about 1 ft. to one side. At the location of each hanger drop the bob over the same side of the shaft and carefully measure the distance from the string to the

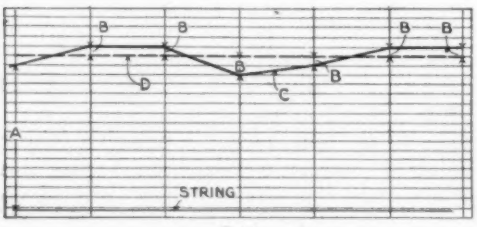


FIG. 2

The Shaft is Plotted on Profile Paper and the Distances It Is Out of Line Recorded

point of the bob A, Fig. 1. Plot these results, as shown in Fig. 2, on a sheet of profile paper and relocate the shaft on it, taking the new line so that the adjustments will come within the range of the hangers. The distance B of the actual shaft line C from the required line D will give the amount of adjustment at each hanger necessary to place the shaft in the vertical plane. The results should be plotted to a large scale transversely, but longitudinally any scale may be used within the limits of the paper. The hangers should now be adjusted to the right or left as the amount, or distance, B indicates.

To adjust in the horizontal plane the level board and U-bars are used. The U-bars are necessary to get between and past the pulleys on the shaft, otherwise this adjustment could be made directly on the shaft. The U-bars are placed at convenient distances, about 8 ft. apart or the hanger distance, from each other, and the level and board placed on the first two, as shown in Fig. 3. The level board is then raised until it is level. The amount it is raised or lowered at the end from the starting point gives the adjustment. Next the level and board are placed on the second and third U-bars and the adjustment made in the same

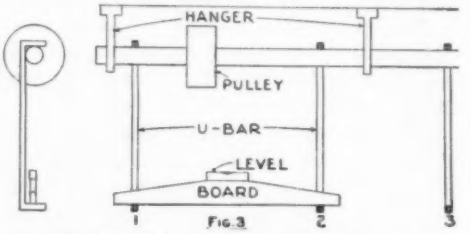


FIG. 3

The U-Bars, with the Aid of a Level Board and Level, Locate the Shaft's Position Horizontally

manner. This gives the adjustment necessary with reference to the second U-bar. The first U-bar is then placed on the other side of the third U-bar, and the level again used. This is continued to the end of the shaft. The results are plotted with reference to the first point, as shown in Fig. 4. It must be remembered, in plotting, that each point is taken with reference to the one preceding it, the starting point being taken as zero. The new line of

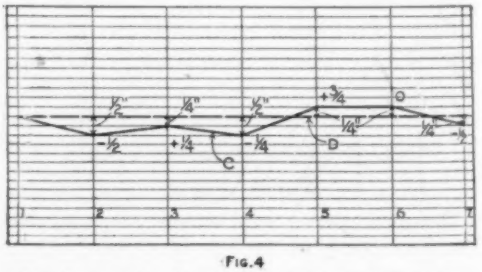


FIG. 4

The Plot of the Shaft in the Horizontal Position, Showing Amount of Adjustment at Each Hanger

the shaft is now drawn as in the previous case, and the distances measured. The hangers are adjusted to give

the required horizontal center line. If the work has been carefully done, the shaft will be found perfectly alined.

In using the U-bars, the center on the leg of the bar must be directly below the center of the shaft, and the level board should be reversed each time to eliminate any possible error due to faulty construction of the level or board. In plotting the points for the horizontal adjustment, the results are cumulative, that is, if point 1 is zero and point 2 is —½ in., point 3 is +¼ in. with reference to point 2, but —¼ in. with reference to point 1. By this method the shaft can be adjusted for any required condition of parallelism.—Contributed by S. A. Peck, W. Lafayette, Ind.

Uses for Left-Hand Drills

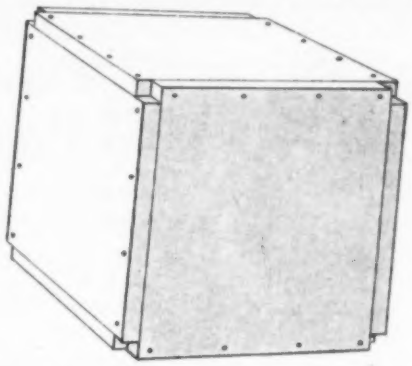
No doubt many mechanics have never heard of left-hand drills and would regard them as a joke, yet they are a useful thing in many shops. These drills have their flutes cut in the opposite direction to the ordinary, and to cut they must, therefore, be turned in the opposite or left-hand direction. They may be obtained from any drill manufacturer at practically the same price as the ordinary drill.

They are useful when, for some reason or other, a regular drill "digs" in or sticks in the cut. A common example is the drilling out of a hole that has threads in it. The points of a regular drill would catch in the threads and make a slow and poor job. A left-hand drill will cut over the angle of the threads, not into them, and do it easily and quickly.

A Strong Box of Simple Construction

A shipment of small brass parts, weighing close to 200 lb., was sent to me in a square wood box of somewhat unusual construction, since it had no particular top or bottom, yet was remarkably strong throughout.

The box was made of six 12-in. lengths, sawed from a 10-in. pine board, 1 in. in thickness. Two pieces stood parallel on their longer edges, and a third piece was nailed lengthwise across them. A similar piece was

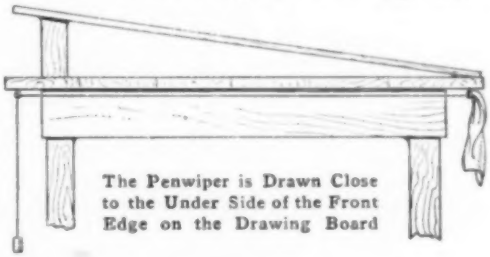


A Box without a Special Top or Bottom, Producing a Very Strong Construction for the Shipment of Castings

nailed across the bottom, and two others, one at each end, completed the box, which, as will be seen, was composed of the least number of pieces possible; and it would not have been stronger with twice that number.—Contributed by W. W. Slocum, Buffalo, N. Y.

Penwiper Holder for a Drawing Board

About the most troublesome thing a draftsman has to deal with is the penwiper. A solution of this trouble is clearly shown in the sketch. The rag is held at the end of a string which passes through two small screweyes turned into the under side of the board, or table. At the free end of the string is tied a small weight. The rag, after

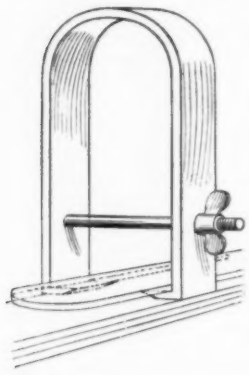


The Penwiper is Drawn Close to the Under Side of the Front Edge on the Drawing Board

using, is simply dropped and the weight jerks it into place. It is always where it can be reached, and out of the way as well.

Blade Spreader for Elliptic Springs

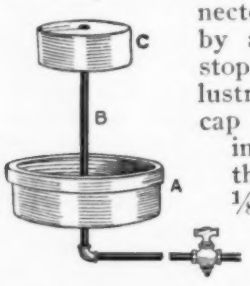
The spreader consists of a piece of bar steel, bent into a U-shape as shown, with small projections on the inside of the lower ends. A bolt is run through holes drilled in the sides and a thumb nut used on the threads. The projecting ends are filed to a chisel edge.



In use, the sharp projections are inserted between the blades of the spring and the nut is turned up. This will separate the spring parts so that oil can be readily placed between them.—Contributed by Albert H. Waychoff, Koenig, Col.

Crude-Oil Burner Made of Pipe Fittings

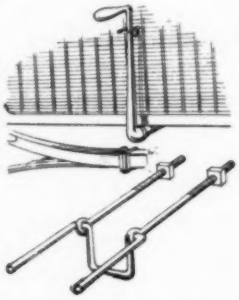
An adjustable and practically smokeless crude-oil burner can be made of an ordinary 5-in. and 3-in. pipe cap connected to the oil supply by a ⅛-in. pipe and stop valve. In the illustration, A is the 5-in. cap drilled and tapped in the center, from the closed side, for a ⅛-in. pipe thread; B is a piece of pipe 6 in. long, threaded the usual distance on one end but about 4 in. on the other. This is firmly screwed into A, allowing the long end to project above the cup side of the cap. The 3-in. flange C is drilled and tapped in the center from the cup side to fit the long threaded end of B so this will come flush with the top of the cap. The burner is now ready to be connected to the crude-oil supply by the necessary pipe fittings and stop valve, placing the burner lower than the supply, so the oil will flow by gravity.



To operate the burner, pour a little kerosene in the cap A and light it; then open the regulating valve, allowing the crude oil to flow out on top of the cap C and drip over the edges into the cap A, where it is burned. After a short time, the cap C will be sufficiently hot to ignite the oil, which will then burn with a steady and safe flame that can be regulated to suit.

Starting-Crank Holder on an Automobile

A device for holding the automobile starting crank in a vertical position when not in use can be easily made of a $\frac{3}{16}$-in. rod and two eyebolts. The bolts are run through the openings in the radiator and drawn up tightly. The rod for the holding device is bent as shown. The rod ends are raised, then dropped after the crank is placed in a vertical position.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.



Preserving Solid Ground Paints

To keep solid ground color in oil or japan without drying out and forming a skin over the top, prepare the can when opening it in the following manner: Cut out the can top carefully close to the sides, so that the entire diameter will be unobstructed, and place the part cut out on top of the paint. Cut several sheets of cardboard, using the bottom of the can for a pattern, and

place them on the tin top covering the paint. Cut a square opening at the lower part, in the side of the can, only severing the upper end and the two sides, then turn the piece down. Make a square plug to fit this hole and use it as a cork.

To take the paint from the can, remove the cork and press down on the cardboards and tin that cover the paint. This action is the same as in using a lead tube of color. Very little paint will be wasted, and the color will be preserved fresh and ready for use.—Contributed by W. M. Mitchell, Minneapolis, Minn.

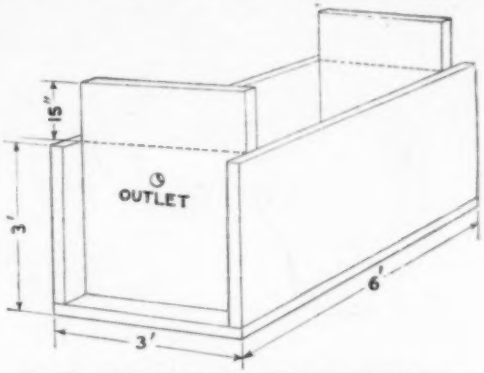
How to Make a Large Water Rheostat

It is often desirable, in testing generators and watt-hour meters, to have some means of providing a steady load on a line, and in such cases the water rheostat will be found exceedingly satisfactory, while the cost of its construction is very small. The essential parts are a suitable containing case, usually a wood box, a number of lengths of ordinary iron-fence wire, and a number of switches. The most expensive item is the switches.

A rheostat will be described that will take care of a load of 2,000 amperes at 220 volts. This will require approximately eight strands of wire, about .105 in. in diameter and each strand about 95 ft. long. These wires are coiled about a piece of pipe, 2½ in. in diameter.

The dimensions of the wood box are given in the sketch. An inlet hole, 1 in. in diameter, is bored in one end near the bottom, and another hole, 2 in. in diameter, is bored in the other end about 6 in. from the top. The smaller opening is connected to the water system, and the larger opening serves as a drain. The water connections to this box should be made through at least 30 ft. of rubber hose, to prevent a ground.

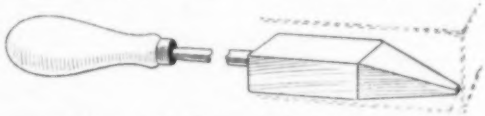
The lengths of iron wire are connected from a common busbar, at one end of the box, to one terminal of several switches, at the other end, the remaining terminals of the switches being connected to a second busbar. These busbars are to form the terminals of the rheostat, and are mounted on the extensions of the box ends. The number of switches required will depend upon how many divisions of current are desired. The eight wires might be grouped as follows: three in one circuit, two in two circuits, and one in the third. This arrangement would require three switches. The connections from the busbar and the switches to the iron wire should be of copper until they pass under the water. If the rheostat is to be operated on a 110-volt system, the lengths of wire are reduced to one-half of the values given.



The Box to Hold the Iron Wires, the Ends being Extended for the Busbars

Special Shape for Soldering Iron

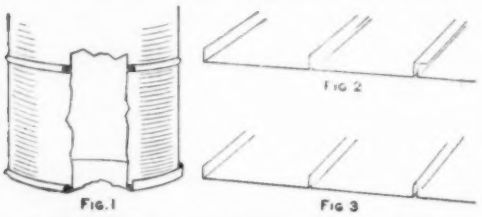
In the ordinary soldering iron the copper point is usually shaped like a pyramid with all sides tapering to the tip. In the special shape illustrated, one side is flat, all the other sides tapering to a point on the flat side. This shape permits soldering in confined places, like the edges of long narrow boxes, as the iron can be used when held parallel with the sides.—Contributed by J. W. Ladlow, Globe, Ariz.



The Point of the Copper is Set to One Side for Use in Close Places

Small Circular Tanks Made from Thin Sheet Iron

Serviceable tanks, up to 1,000-gal. capacity, can be built of thin sheet iron, several widths in height, if the proper



Section of Tank with Upright Edge of Bottom being Peened Over, and Manner of Forming the Metal Sheets

connections are made. In figuring on a certain-size tank the following formulas can be used:

$G = \frac{22 \times R^2 \times H}{7 \times 231}$ or, $R^2 = \frac{G \times 7 \times 231}{22 \times H}$ or $H = \frac{G \times 7 \times 231}{22 \times R^2}$

In which G represents the capacity of the tank in gallons; R, the radius in inches, and H, the height. The radius, as found by the formula, corresponds to the internal dimension of the tank. For the bottom piece an extra amount must be added to form the bead, shown in Fig. 1, connecting it with the side sheet. For every inch of internal diameter of the tank, the side pieces should be $3\frac{1}{7}$ in. long and a further amount added to form the vertical seam. Each side plate, if several are used, should be bent, as shown in Fig. 2, one edge at right angles and the other to a double right angle. The uppermost plate should be formed with a single bend at each edge. The sections can then be put together and the double edges peened over, as shown in Fig. 3, after which the complete side should be rolled to a cylindrical shape. This can be set on the cup-shaped circular bottom, whose upright edge is then peened over. The various connections should be soldered to prevent leaking, and the tank is then complete. A flat or a cone-shaped top may be added if desired.—Contributed by S. C. Shipman, St. Petersburg, Fla.

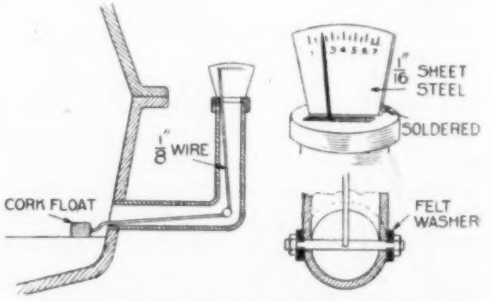
¶Never adjust a machine while it is running.

Tempering Long and Narrow Pieces of Steel Evenly

Every mechanic knows the difficulty encountered by warping when tempering a long and comparatively narrow piece of steel. One day it fell to my lot to temper a reversible shear blade, 10 in. long, $2\frac{1}{4}$ in. wide, and $\frac{1}{2}$ in. thick, having three $\frac{7}{16}$-in. countersunk holes, 4 in. apart, along its center. The job was accomplished as follows: I procured two straight pieces of common iron, $\frac{1}{2}$ by $1\frac{1}{4}$ in., having a convenient length greater than the blade of steel, and after heating the shear to a bright cherry-red, I laid it parallel with and centrally on one piece, then laid the other piece opposite on top of the shear, and gripping all three pieces firmly with the tongs, plunged the whole in oil. To my surprise, not only was the shear perfectly straight, but the central portion, lying between the two pieces, was toughened to such a point that it could be filed. The cutting edges were nicely tempered.—Contributed by Ralph N. Geffray, Los Angeles, Cal.

Gauge for Indicating Level of Liquid in a Tank

It is frequently necessary to maintain a practically uniform level of the oil, or similar liquid, contained in a tank or engine crank case. A simple



An Indicator and Float Attached to a Pipe for Gauging the Liquid Level of a Receptacle

device for indicating slight variations of level can be made as shown in the illustration. It consists of a piece of $1\frac{1}{2}$-in. tubing, or pipe, bent at right

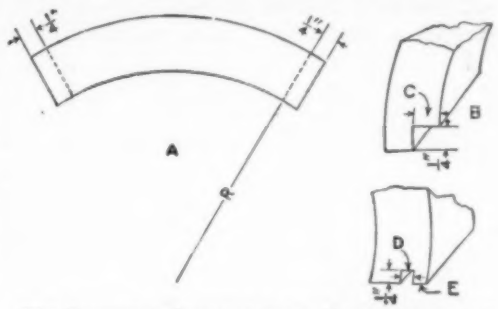
angles, as shown, and threaded at one end for the purpose of screwing it into the tank or crank case. At the top of the tube is placed a cap, provided with a slot for the indicating hand. On a sheet-iron dial, fastened to the cap, can be marked the desired levels and the quantity of oil corresponding to each. A hole is drilled through the tube at the bend to serve as a bearing for the fulcrum pin of the indicating lever. This should be drilled and tapped at the center for two holes, at right angles to each other, to fit the float lever and indicating arm. It is fastened in place with felt washers and nuts, so as to move freely in its bearings while preventing leakage if the liquid should fill the tube. The dial is calibrated by pouring in a definite amount at a time, a mark being made corresponding to each amount added. As can easily be seen, the variations of levels to be indicated must be small, corresponding to the extreme positions of the float lever, as it strikes the top or bottom of the bent tube.—Contributed by Adolph Kline, Newark, N. J.

Fastening for Segment Ends in Pattern Work

In making wood patterns, it is frequently necessary to have loose pieces in the shape of thin rings, which are always difficult to construct so that they will stand hard usage. The joints commonly made are either feathered or end-lapped. These are difficult to make and unsatisfactory for the purpose.

The illustrations show the manner of using a jig on a circular saw for making a satisfactory joint at a fraction of the cost of the ordinary joint, and one that will hold the parts securely. Cut the segments as shown at A, making them ½ in. longer than a true segment, which allows ¼ in. on each end for the making of the joint.

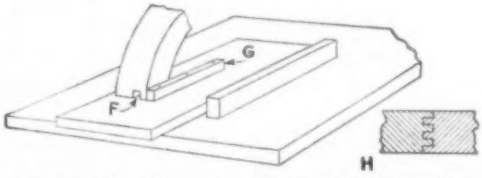
Saw the segments as shown at B, making the dimension C just the width of a saw cut and ¼ in. deep. Saw the opposite end of the same side as shown at D, making the dimension E the thickness of C. This brings the work up to where the jig is used on the saw table. Procure a board of any size that is true, and secure it to the saw table



The Segment is Prepared in the Usual Manner and a Kerf and Groove Cut in the End

with screws or clamps so that the saw, when run up through it, will be about 4 in. from the fence. Run the saw up through the board until it projects just ¼ in. Stop the saw and place the kerf D over it, as shown at F, and in this position fasten the strip G as indicated, which must be just the width and thickness of the groove D and about 14 in. long.

To use the jig, place the groove D over the piece G and run the saw through without changing the depth of the cut. The result will be another groove like D at a distance equal to E from it. Proceed in like manner until all ends are completed. The joint thus



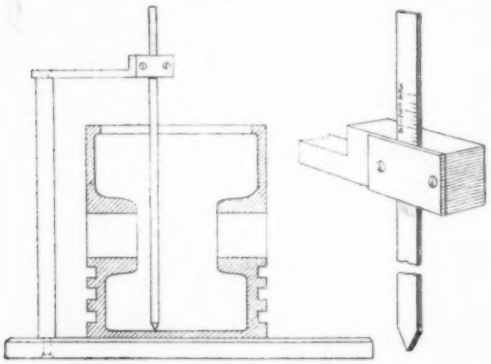
The Jig as It is Placed on the Saw Table for Making All Grooves Uniform and Alike

made appears as shown at H, and when well glued, it is the strongest possible construction.—Contributed by D. D. Gurnee, Hampstead, N. Y.

¶ Do not keep a spare casing tied up until the moment it must be used. Substitute it for one in use and take plenty of time to repair small cuts that will permit moisture to reach the fabric.

A Piston-Head Gauge

The sketch illustrates a device for gauging the head thickness of a gas or gasoline-engine piston. This instrument is very useful in a garage where

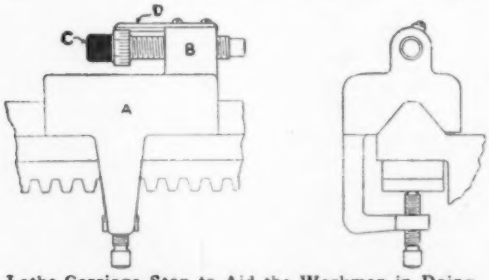


The Thickness of the Metal on a Piston Head can be Easily Measured

new pistons are constantly being made for replacement. It consists of a metal base, planed true on its surface, with a perfectly vertical post carrying a horizontal piece of metal. A metal rod, pointed at the lower end and provided with a scale, slides vertically through the horizontal piece, as shown in the drawing. The length of the post will depend on the largest piston to be measured.

Graduated Stop for a Lathe Carriage

Where accuracy is required on facing, counterboring holes, and like work on an engine lathe, a graduated stop



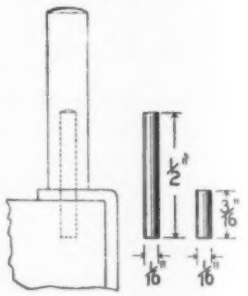
Lathe-Carriage Stop to Aid the Workman in Doing Fine Work on Facing, or Counterboring Holes

for the carriage is desirable. Such a stop can be easily constructed as shown. The body A is preferably made of malleable iron, although gray iron will do as well, providing the clamp arm which carries the setscrew is large enough to stand the strain.

The boss B, at the top, is bored and threaded to receive a knurled screw, C, which has 40 threads per inch. The large diameter is graduated to make 25 divisions, thus making each graduation .001 in., the readings being easily set by the use of the pointer D. With this stop, it is possible to remove .001 in. from the work, thus doing away with the cut-and-try method.—Contributed by A. Dane, Pottstown, Pa.

Steel Wasted to Save Time

Several hundred pieces of a certain kind of work were to be made that required a $\frac{1}{16}$-in. pin, $\frac{3}{16}$ in. long, driven into them. After a little trying, it was found almost impossible to handle the pins. The method adopted was to make the pins ½ in. long, and to make a hand punch with a recess, $\frac{5}{16}$ in. deep and of a size to take the pins. The pins were inserted in the punch and by this means they were started very easily in the hole and driven home. Then they were cut off and the rough end ground level. Over twice the amount of steel wire was required, but the time saved paid for it many times.—Contributed by Donald A. Hampson, Middletown, N. Y.



Removing Broken Pencil Ends in Telephone "Jacks"

The operators in a telephone exchange persisted in sticking their pencil points in the "jacks" on the switchboard. The points would break off and cause a great deal of trouble. After the switchboard had been almost wrecked one day, I thought of a plan to clean out the jacks without much

trouble. I procured a vacuum cleaner and used the round tool on the jacks. This not only removed the pencil points quickly, but also cleaned out all dirt that had accumulated since the board was installed.—Contributed by C. W. Elliott, Toronto, Can.

An Aid to a Chimney Draft

It is almost impossible at times to get a good draft in a chimney having a square or rectangular hole. The smoke and burned gases pass up in a circular form and a down pull is created in the corners, and it takes a large fire to make an upward draft for the entire area.

To remedy this faulty condition, obtain a number of common stovepipes of a size sufficient to carry the gases from the stove or furnace, and after jointing them up, introduce them into the chimney and connect the lower end to the smoke pipe leading from the stove or furnace. There will then be a circular opening inside of the chimney, out of sight and safe from risk of fire, which will give a better draft than before. It is not difficult to make the connection.

For a similar connection to a grate, it would be necessary to have a funnel-like piece to fit into the chimney just above the fireplace. The opening in the top of this must be circular and of a size to receive the stovepipe. Dampers or other means of control are easy to arrange.—Contributed by Geo. W. Weaver, Standpoint, Idaho.

Substitute for a Drawing Pen

It is not necessary to use a drawing pen in drawing regular, even ink lines. Use the reverse side of an ordinary steel-pen point, and just as satisfactory results will be obtained. The size pen point to use depends on the width of the line desired. It does away with the time necessary to properly ink a regular drawing pen, as it is only necessary to dip the pen in the usual way.—Contributed by L. E. Turner, New York City.

Locking an Oil-Tank Pump

A simple means for locking an ordinary tank pump, to prevent its being used, can be easily made from a strip of metal and a padlock. The strip in

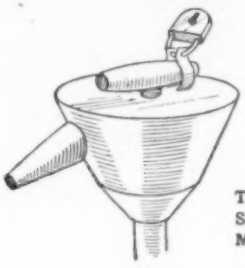


FIG. 1

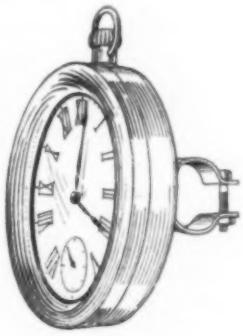
FIG. 2

The Handle of the Pump Slips In between Strips of Metal Where It is Locked

Fig. 1 should be of sufficient length to pass around one end of the handle and should have holes at the ends for attaching the padlock. The strip may be attached to the pump head either by soldering it or passing the ends through holes made for them, as shown in Fig. 2.—Contributed by Joseph J. Kolar, Maywood, Ill.

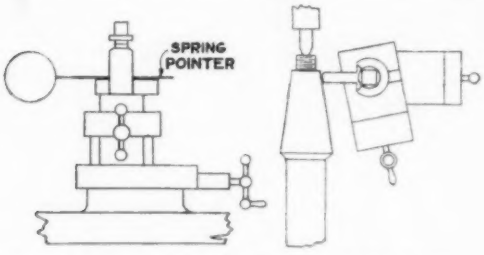
A Motorcycle Watch Holder

A watch holder for a motorcycle can be easily constructed of a small flat tin can or box of the kind used by druggists for salve or powders. A circular piece, the size of the watch face, is cut from the cover with a circular can cutter. A slot is made in the side to admit the stem of the watch. If the watch does not fit snugly in the box, paper or cotton may be packed in tightly to fill up the extra space. The cover is put on and soldered in place, and a piece of metal is bent as shown and soldered to the back of the case. The holder is clamped to the handlebar. An inexpensive watch will serve the purpose.



Setting Compound Rest for Cutting Piston-Rod Taper Fits

The sketch shows a method of turning tapers on a locomotive piston-rod lathe which produces an accurate taper

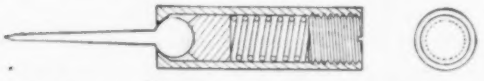


The Compound Rest is Easily Set to the Proper Taper with the Spring Pointer

on a rod with the use of the compound rest. The back and front sizes of the taper are cut on the piston rod, the steel pointer is placed in the tool post and tightened, and the compound carriage is set to a correct taper. This can be quickly and easily done, as the spring pointer can be pushed up and over the unfinished portion of the fit while the compound rest is run between the two sizes.

Self-Truing Pointer for Lathe Work

It is often required to have a point run perfectly true with the shaft of the milling machine or lathe, to locate a hole in a piece of work. In such a case it is generally necessary to chuck a piece of work and true it up with a tool such as a pointer. The device shown does away with this extra work, as it is only necessary to clamp it in the chuck and, by holding something stationary against the point, it will true itself. The spring should have just enough tension against the plunger to keep the ball of the pointer firmly seated, the screw in the end being used for adjusting the tension.



When Turning in a Chuck the Pointer will True Itself When Something is Held against It

Repairing Burner Base Broken from Blowtorch

It is a common occurrence that a blowtorch is put out of commission by having the blast pipe bent or broken from the head of the gasoline container. Sometimes a slight blow will loosen or cause a leak in the connection. When an accident of this kind occurs, I make a repair by threading the hole in a brass door-knob plate, screwing the pipe into it, and soldering, or riveting, the plate on the top of the container. The edge of the plate extends far enough to make a neat repair.—Contributed by P. D. Merrill, Chicago, Ill.

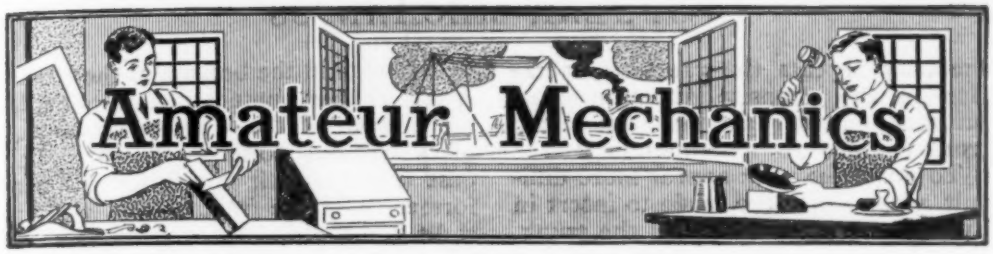
Truing Sights on a Rifle

To true the sights on a rifle by the old method a workman is apt to use six or eight cartridges and more than an hour's time. The setting of the sights can be accomplished in 15 minutes with one cartridge, if done as follows:

Fasten a clamp of some kind to a post, or any convenient place, so that it will be rigid and secure. Fasten the loaded rifle in this clamp and set up a wide board in front of the rifle in such a position that the bullet will strike some portion of the target. The distance from the gun to the target must be known, to set the sight. Fire the cartridge and locate the bullet hole, set the sights to target with the hole, and they will be true, provided the gun was not moved.—Contributed by R. D. Benjamin, Cumberland, Md.

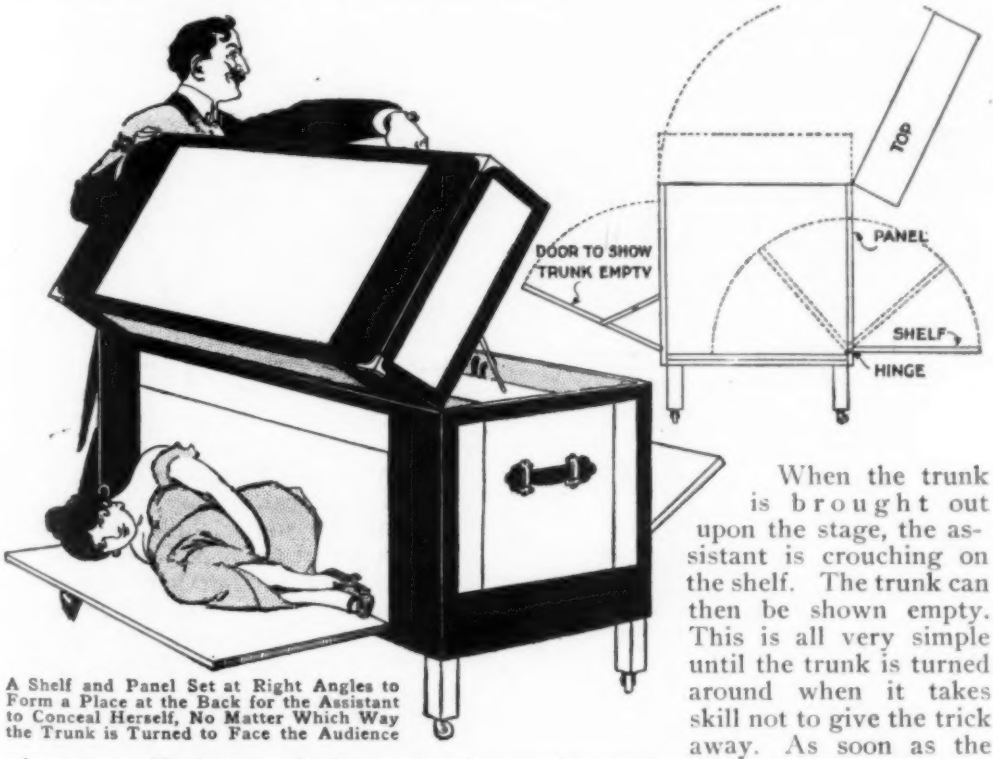
A Substitute Washer

As I needed several washers and none of the proper size was at hand, I made a splendid substitute by wrapping several turns of soft wire on the bolt before putting on the nut. This will work equally well for large bolts as for small ones.—Contributed by H. W. Hilton, Hopington, B. C.



A Trunk Mystery

Doubtless every person has seen the trunk mystery, the effect of which is as follows: A trunk, mounted upon four legs, is brought out on the stage and proven to be empty by turning it all the way around to show that there is nothing on the back, whereupon pieces of plate glass are placed along the back, sides, and front, the trunk is closed and given a swift turn and then opened, when to the amazement of all, a lady steps out appearing to come from nowhere. The secret of this trick is very simple, and the trunk can be made up very cheaply.



A Shelf and Panel Set at Right Angles to Form a Place at the Back for the Assistant to Conceal Herself, No Matter Which Way the Trunk is Turned to Face the Audience

In the back of the trunk there is a movable panel with a shelf exactly the same size as the panel attached to its bottom, forming a right angle, the corner of which is hinged to the bottom of the trunk. The back panel can be turned in until it rests on the bottom of the trunk and, when this is done, the shelf part rises and takes its place, making the back of the trunk appear solid.

When the trunk is brought out upon the stage, the assistant is crouching on the shelf. The trunk can then be shown empty. This is all very simple until the trunk is turned around when it takes skill not to give the trick away. As soon as the performer starts to turn the trunk around, the assistant shifts her weight on the panel, thus causing it to fall inward and bring the shelf up to make the back appear solid. The assistant is now in the trunk, and the back can be shown clear of any apparatus. When the trunk is turned to the front again,

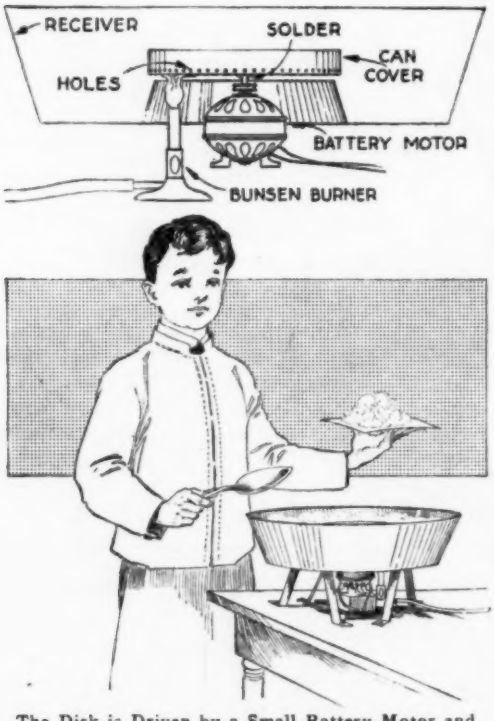
the lady repeats the previous operation in the opposite direction, thus bringing her body to the back of the trunk again.

To make the trick appear more difficult, glass plates are made to insert in the ends, front and back of the trunk. In making the trunk, have the back the same size as the bottom. Fit the piece of glass for the back into a light frame, similar to a window frame. This frame is hinged to the bottom of the trunk and is ½ in. smaller all around than the back of the trunk, so that the two pieces of glass can be put in the ends and also allow the back frame and glass to fall flush in the bottom of the trunk. A few rubber bumpers are fastened in the bottom of the trunk to catch the glass without noise as it falls. The best way to work this is for the performer to let the frame down with his right hand while he is closing up the front with his left.

As soon as the trunk is closed, the assistant again shifts her weight to cause the panel to fall in and then the trunk can be turned to show the back, or whirled around and turned to the front again, then opened up, whereupon the assistant steps out, bows to the audience, and leaves the stage.

How to Make a Candy-Floss Machine

Every person is familiar with candy floss, made at stands on fair grounds, or carnivals, in an expensive whirling machine. It is not necessary to wait for a fair or a carnival to have a bunch of candy floss, as it can be made at home much quicker than making taffy candy.



The Disk is Driven by a Small Battery Motor and Melted Sugar is Spun Out into Floss

The device for making the candy floss consists of ordinary things that can be had in any home, and usually a boy has a battery motor of some kind that will furnish the power.

Procure a tin pan, the shape of an ordinary dish pan and of medium size; cut a hole about one-half the diameter of the pan in the bottom and solder in a conical-shaped piece similar to a cake pan, allowing it to extend up inside about half the height of the pan. Fasten supports to the pan so that a Bunsen burner can be set under it where the flame will pass through the conical center opening.

Mount a small battery motor with its shaft vertical, pulley end up, and centering the conical hole, on a base, which supports the pan. Procure a can cover, similar to that used on coffee cans, and fasten it with solder to the pulley on the motor shaft, being careful to locate it centrally so that it will run smoothly.

Close to the bottom and in the rim of the can cover, make a number of small holes with a prickpunch, or other sharp-pointed tool. Wire the motor to the battery, and the candy-floss machine is ready for use.

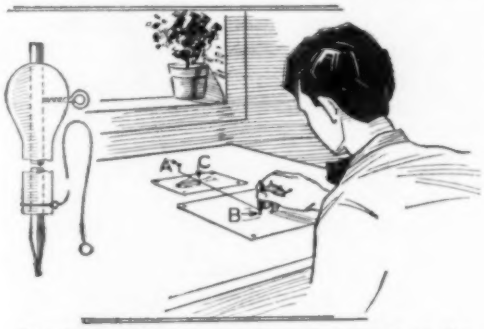
Light the burner, start the motor, and pour a little granulated sugar in the revolving can cover. As the sugar is melted, it will be spun out in floss

form through the small holes into the pan receiver.—Contributed by Herbert Hahn, Chicago, Ill.

Enlarging Pictures

A very simple and sufficiently accurate way of enlarging pictures by means of a pencil holder and elastic is shown in the illustration. The picture to be enlarged is fastened to a table top or drawing board, and the paper on which it is to be drawn is placed directly below it. A small brad or tack is driven into the board at A, the location depending on the desired size of the enlarged picture, and the elastic is attached to it. The pencil holder B is fastened to the other end of the elastic over the drawing paper. A pointer, or a knot, is placed in the elastic at C. The pencil holder consists of a stick of wood turned into a handle with a hole bored centrally for a pencil.

In use, the pencil is moved over

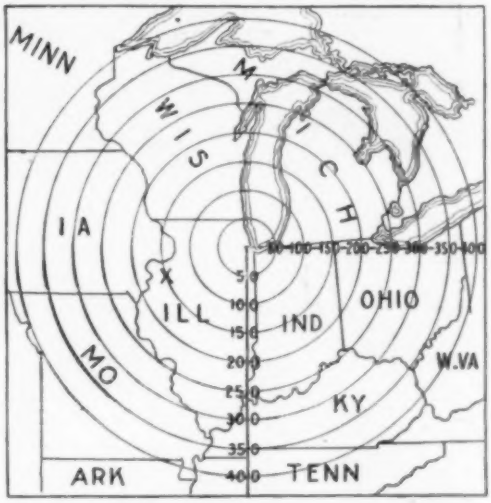


The Size of the Enlarged Picture Depends on the Length of the Elastic and the Spacing of Pencil and Pointer

the drawing paper while the knot or pointer is watched, to keep it following the lines of the original drawing. The stretch of the elastic is sufficient to enlarge the parts equally, as well vertically as horizontally.—Contributed by Wm. Weitzsacker, Buffalo, N. Y.

Distance Chart for Wireless Stations

The amateur wireless telegrapher may be troubled more or less regarding distances from other stations. The difficulty can be overcome by following a plan similar to that of a parcel-post map. A map should be selected covering the desired territory. With the home station as center, circles



Circles on a Map the Same as for Parcel Post to Designate Wireless Distances

should be drawn to diameters corresponding in length to the scale used on the map. By measuring the distance other stations may be from any of these circles, their cross-country distance from the home station can be determined at a glance.—Contributed by E. L. Hartlett, Wausau, Wis.

A Carrier for Fishhooks

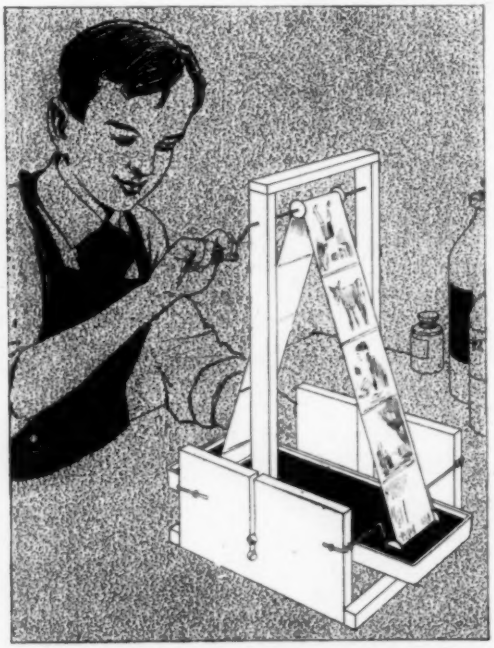
Hooks that are attached to gut or short strings are difficult to carry and to keep in good shape for use on a line. I made a carrier that overcame this trouble, from a block of wood. The block is ½ in. in thickness with brads driven into one end, for engaging the loops on the gut or string, while the hook is caught on the opposite end, the block being just long enough for

The String is Drawn Taut over the Block, and the Hooks are Caught in the Block End

the short line. The hooks will be held securely, and the block can be carried in the pocket.—Contributed by Victor E. Carpenter, South Bend, Ind.

Adjustable Film-Developing Machine

The simple homemade developing machine, shown in the illustration, can be easily made with three film spools,



Developing a Roll Film in a Tray with a Machine That Drives the Film around Rollers and through the Developing Liquid by Turning a Crank

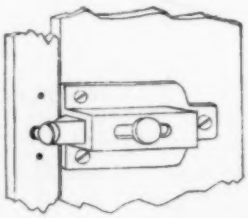
some strong wire, and odd pieces of wood. It consists of an open frame, having two side pieces provided with slots down the center, sufficiently wide to allow an ordinary wood screw, of suitable size, to slide up or down freely. The two end-connecting pieces act as supports for the developing tray and should be made of sufficient length so the tray can pass freely between the sliding upright frame, made to fit in between the side pieces of the base. This frame can be adjusted to suit the length of film and is clamped in place at the desired position by wood screws, fitting in the long notches and screwed into the uprights. The two bottom rollers consist of film spools which are fastened in place by being slipped over a suitable wire, bent so the spool can enter the developing tray and the wire pass over the sides. Another bend at the outer end provides for the adjustment of the spools and for securing the wire in place by staples. The top spool is secured to a wire fitted with a crank at the outer end, so that in turning the wire, the spool will also turn, thereby driving the film. When placing the film on the machine, the sensitive side should face outward so it will not rub against the spools. The ends of the film may be connected with pins or ordinary paper fasteners.—Contributed by H. R. F. Richardson, Ottawa, Ont.

Preventing Loss of Fish from Covered Baskets

In the cover of fish baskets an opening is frequently made permitting the fish to be put in without lifting the cover. In traveling over rough places, or when the basket is full, some of the fish are likely to be shaken out, or may wiggle out of the basket. To guard against this, a leather flap can be provided covering the hole on the inside. At one end of the flap, four holes should be punched. It can then be placed in position and securely laced to the cover. The flap acts as a valve, allowing fish to be put into the basket, but preventing their escape.—Contributed by A. W. Cook, Kamela, Ore.

Repair for a Broken Lock Keeper

Having broken the recess half of a common cupboard lock, or latch, which was used to fasten a hinged storm window, I used a round-head wood screw as shown. The screw was easily placed, and it serves the purpose as well as the regular keeper.—Contributed by R. F. Pohle, Lynn, Mass.



¶When using glue contained in screw-stoppered vessels it is advisable to smear a little vaseline on the thread to prevent the stopper from adhering to the container.

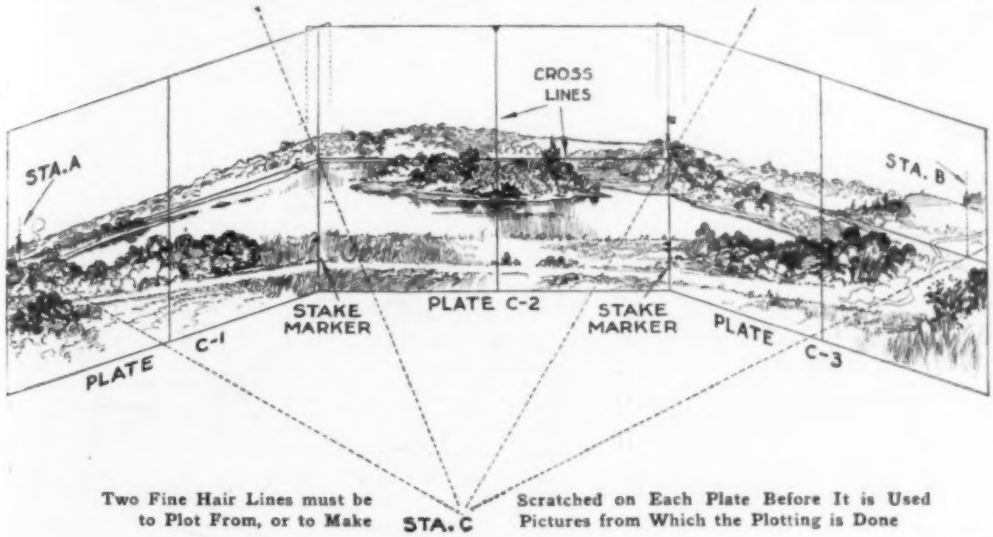
THE BOY SURVEYOR
Plotting a Camera Survey

by Harold G. McGee

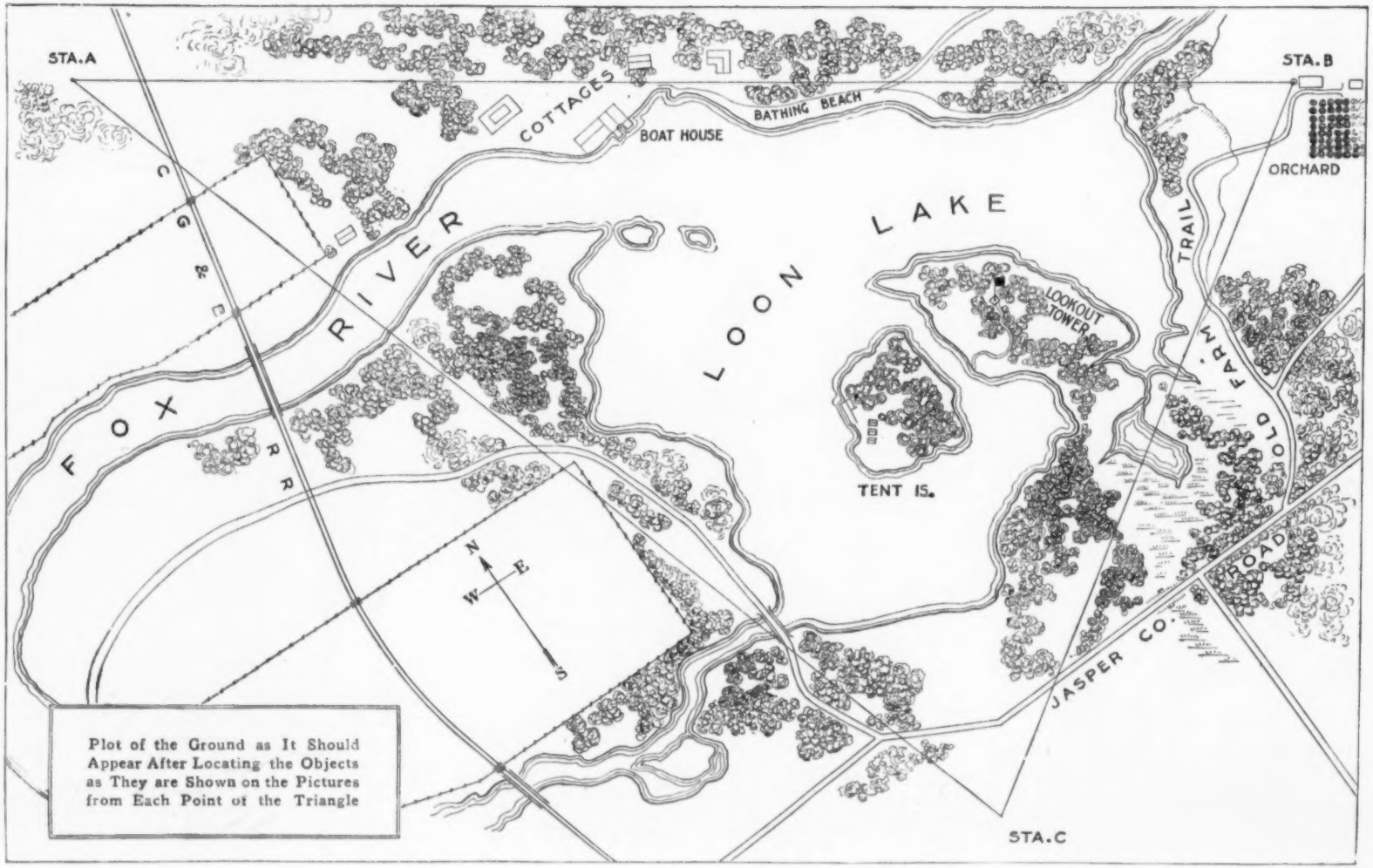
[The camera records pictures that can be taken in camp or on a vacation trip and kept until more leisure may be had in winter for plotting the ground.—Editor.]

A PREVIOUSLY measured base triangle with "stations" at each corner is necessary for making a camera survey, just as it is for the plane-table survey. It is preferable to have each of the three sides measured independently, though if one side has been accurately chained, the other two may be less satisfactorily determined by the use of the plane table. If the camera has a fixed focus, it is possible to make an entire survey from the two ends of a single base line; but this method has no check and should be used only when and where the triangle method is impossible. With an adjustable focus, it will rarely give good results.

Once the triangle has been laid out, the fieldwork is very simple. The camera is set up at one station, carefully leveled, and then a series of pictures is taken, each single plate overlapping the last so as to form a panorama of the area to be mapped. The focus of the lens must not be changed during a series, and plotting is facilitated by keeping the focus constant during all the exposures which make up a survey. To secure good depth of focus, a small stop is generally used, since it is necessary to use a tripod to keep the camera level. If contours are to be drawn, the height of the lens above the ground at the station should be measured and recorded. After a series has been taken at each station, the fieldwork is complete. It is an excellent plan to keep a record of the plate numbers, and the order in which and the station from which the exposures were made, so

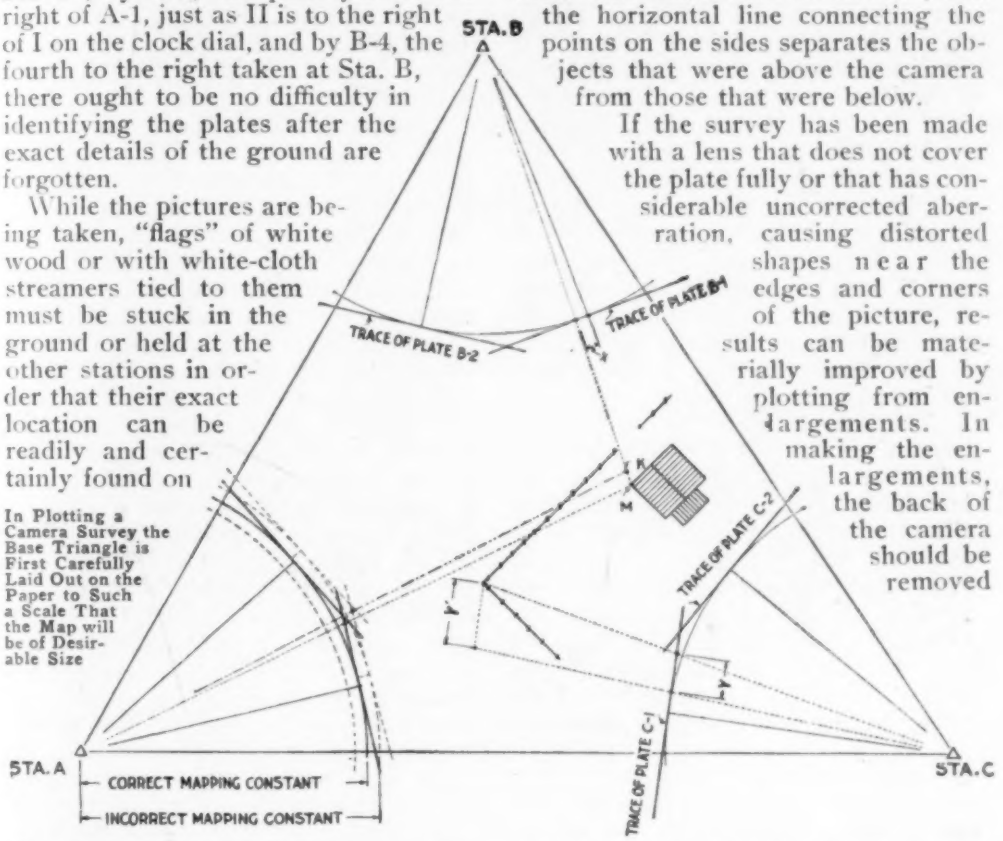


Two Fine Hair Lines must be Scratched on Each Plate Before It is Used to Plot From, or to Make Pictures from Which the Plotting is Done


STA.A
STA.B
COTTAGES
BOAT HOUSE
BATHING BEACH
ORCHARD
C. G. & E.
FOX RIVER
LOON LAKE
LOOKOUT TOWER
TRAIL
FARM
ROAD
TENT IS.
JASPER CO.
N
E
W
S
STA.C
Plot of the Ground as It Should Appear After Locating the Objects as They are Shown on the Pictures from Each Point of the Triangle

that the 10 or 12 plates which a small survey will comprise may not get hopelessly mixed up. If the camera is turned each time to the right, clockwise, and the plates are numbered A-1, A-2, B-4, etc., indicating by A-1, for example, the leftmost plate taken at Sta. A; by A-2, the plate just to the right of A-1, just as II is to the right of I on the clock dial, and by B-4, the fourth to the right taken at Sta. B, there ought to be no difficulty in identifying the plates after the exact details of the ground are forgotten.

While the pictures are being taken, "flags" of white wood or with white-cloth streamers tied to them must be stuck in the ground or held at the other stations in order that their exact location can be readily and certainly found on the plates. A few distinctive stakes, some with one and some with two or three strips of cloth tied to them, placed at important points on the ground will help immensely in the location of knolls and shore lines.



In Plotting a Camera Survey the Base Triangle is First Carefully Laid Out on the Paper to Such a Scale That the Map will be of Desirable Size

In plotting a camera survey, either the original plates, the prints, or enlargements may be used. The plates are the most accurate if a corrected lens has been used; and the enlargements made back through the lens will be best if the images on the plates are distorted. In any case, two fine hair lines must be scratched on each plate before it is used to plot from, or to make the prints from which the plotting is to be done. One of these lines should connect the points at the top and bottom of the plate, and the other, the points at the sides. The vertical line divides the objects which were on the right of the center of the camera from those that were on the left, and the horizontal line connecting the points on the sides separates the objects that were above the camera from those that were below.

If the survey has been made with a lens that does not cover the plate fully or that has considerable uncorrected aberration, causing distorted shapes near the edges and corners of the picture, results can be materially improved by plotting from enlargements. In making the enlargements, the back of the camera should be removed and the light should be allowed to pass through the plate and the lens in the reverse order and direction of that in which it passed when the negative was made. In this way, the errors which were made by the lens originally will be straightened out, and the resulting enlargements will be free from distortion. To make successful enlargements for surveying work, the easel on which the bromide paper is tacked must be square with the camera, and the paper itself should be flat and smooth. It is just as necessary to keep the easel at a constant distance from the camera during the enlarging

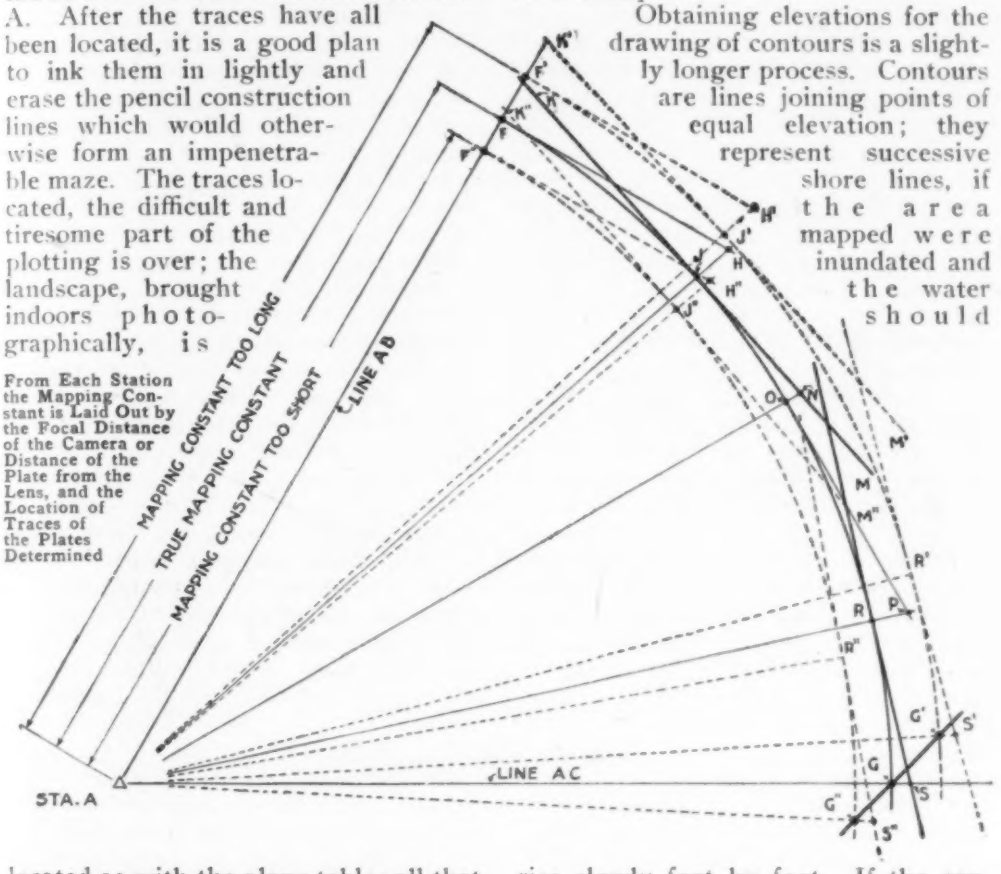
as it was to keep the same focus while the original negatives were being made.

In plotting a camera survey the base triangle is first carefully laid out on the paper to such a scale that the map will be of a desirable size. With the apex of the triangle representing Sta. A, say, as a center, a circle is drawn with a radius as nearly equal as possible to the distance between the optical center of the lens and the plate when the picture was taken. Ordinarily this will be the focal length of the lens; but if the camera was not focused most sharply on an object a great distance off, the radius may be greater. This radius is called the "mapping constant." When an approximate distance for the mapping constant has been determined by measurements on the camera or by knowing the focal length of the lens, the circle, or rather the arc, FG between the two lines to stations B and C, is drawn. The plates taken at Sta. A, and ranged around this circle on the outside and just touching it, will show the landscape exactly as seen from A.

In the accompanying diagram showing the method of determining the mapping constant and of locating the traces of the plates, the letters F, G, H, J, P, R and S designate points referring to the true mapping constant, and the construction necessary to locate the traces of the plates. The primed letters F′, F″, G′, G″, etc., are used to show similar points where the trial mapping constant is either too long or too short. The following description refers equally to the construction necessary with true or trial mapping constants.

Next, a line FH is drawn perpendicular to the line AB of the triangle at the point F where the arc intersects it. On this line is laid off, in the proper direction, a distance equal to the distance on the plate or print from Sta. B to the center vertical line. From this point is drawn a light line, HJ, toward the center of the arc. Where this line crosses the arc, at J, a tangent, KJM, is drawn, which will show the location of the plate A-1 on the drawing. This line is called the trace of the plate. An object which appears both on plate A-1 and A-2 is next picked out and its location on the trace of plate A-1 determined by measuring the distance JN equal to the distance on the plate from the image of the object to the center vertical line. A light line, NO, joining this last-found point with Sta. A, is then drawn. Where this last line crosses the arc, at O, a tangent, OP, to the arc is drawn, and the trace of the plate A-2 is found with the aid of the point which appears on both plates just as plate A-1 was located from the picture of Sta. B. The traces of plates A-3 and A-4 are found in exactly the same way as was that of A-2. If the radius of the arc has been estimated correctly, Sta. C will be found to be exactly on the point where the trace of the plate showing the station crosses the line AC on the paper. If it does not fall on the line AC, which is generally the case, everything must be erased except the original triangle. First, however, a radial line S′G′, or S″G″, is drawn from the location of Sta. C on the trace of the plate A-2, 3 or 4, as the case may be, to the arc, and the point of intersection of this line and the arc, G′ or G″, is preserved. If this point, G′ or G″, is outside the base triangle, the next trial arc should be drawn with a larger mapping constant as a radius, or vice versa. If the second mapping constant is off, find again the point of intersection of the radial line through the new location of Sta. C on the newly located trace of the last plate and the new arc. Join this point and the one found previously, in the same manner, with a straight line, G′G″. The point G where this last drawn line intersects the line AC of the base triangle, will be the point through which the arc, with the correct mapping constant as radius, ought to pass, provided the first two approximations were not too far in error. This third trial ought to make the location of the traces of the plates exactly correct. If, however, the focus of the camera was changed between ex-

posures at one station, the traces of the plates will not all be at an equal distance from the station point, and their location will be an almost impossible task. The traces of the plates taken at stations B and C are found in exactly the same manner as were those for Sta. A. After the traces have all been located, it is a good plan to ink them in lightly and erase the pencil construction lines which would otherwise form an impenetrable maze. The traces located, the difficult and tiresome part of the plotting is over; the landscape, brought indoors photographically, is located as with the plane table; all that remains to be done is to take the sights and find the points on the paper which show where the objects were on the ground.


From Each Station the Mapping Constant is Laid Out by the Focal Distance of the Camera or Distance of the Plate from the Lens, and the Location of Traces of the Plates Determined
MAPPING CONSTANT TOO LONG
TRUE MAPPING CONSTANT
MAPPING CONSTANT TOO SHORT
LINE AB
LINE AC
STA. A

This taking the sights is a simple matter. With a pair of dividers, the distance of a given object from the center line of the plate is measured. This distance is laid off on the proper side of the point marking the center line of the trace of the same plate; a radial line is drawn through the trace at the given distance from the center-line point and the station at which the given plate is taken; this is one line of sight to the object. The same object is located from another station in the same way; as on the plane table, the intersection of the two lines to the same object marks the location of the point which represents the object on the map.

Obtaining elevations for the drawing of contours is a slightly longer process. Contours are lines joining points of equal elevation; they represent successive shore lines, if the area mapped were inundated and the water should rise slowly foot by foot. If the contours are close together, the ground represented has a steep slope, and vice versa. If, on a map, a number of points are of known elevation, it is simply a question of judgment and practice to tell where contour lines go.

Before contours can be drawn the elevations of a considerable number of points must be known. If the elevation of any one of them is known and the difference between that one and any other can be found, determining the elevation of the second point is simply a problem in addition or subtraction. If it be desired to find, for

instance, the difference in elevation between Sta. C and the corner of the fence, as shown in the sketch, two solutions are possible, as follows:

First: Perpendicular to the line of sight from Sta. C to the fence corner, two lines are drawn, one at the intersection of the trace of the plate by the line of sight, and one at the point on the paper which shows the location of the fence corner. On the first of these two lines is laid off the distance Y′, equal to the distance of the ground at the fence post above or below the horizontal center line on the plate. Through this point, on the first perpendicular on the line of sight, is drawn a line through the Sta. C and extended to an intersection with the second drawn perpendicular. The distance from the corner of the fence, on the paper, to this intersection is the distance Y, the difference in elevation from the center of the camera at Sta. C to the ground at the fence post. This solution is longer and less desirable than the second.

Second: In place of perpendicular lines to the line of sight, the trace of the plate, and a line, through the point representing the object, parallel with the trace, may be used.

A datum plane, or reference surface, from which all elevations are measured up to the ground surface must be assumed. The United States Geological Survey uses mean, or average, sea level for the datum in all its topographic sheets. Generally, unless there is a United States Geological Survey "bench mark," a monument of carefully determined elevation referred to sea level, within the limits of the survey, it is better to assume the elevation of some point, as Sta. C, at 100 ft., or greater if necessary to place the datum plane below the ground level at all points within the area to be mapped. Other elevations are figured from the assumed elevation of Sta. C. Allowance must be made for the height of the center of the camera above the ground at Sta. C in computing elevations above Sta. C. All elevations determined for the purpose of drawing contours are ground elevations and not the elevation of the top of objects located on the map. The topographic sheets of the Geological Survey are good examples to follow, in drawing contours. For many purposes, contours are not essential, and the refinements necessary for their drawing may be omitted.

How to Build a Skiff

The following is a description of an easily constructed 12-ft. skiff, suitable for rowing and paddling. This is the type used by many duck hunters, as it may be easily pushed through marshes. It is constructed of ¾-in. dressed pine, or cypress.

The sides consist of planks, 14 in.

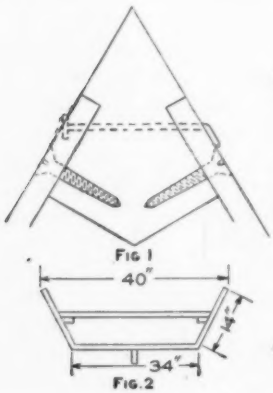


FIG. 1

FIG. 2

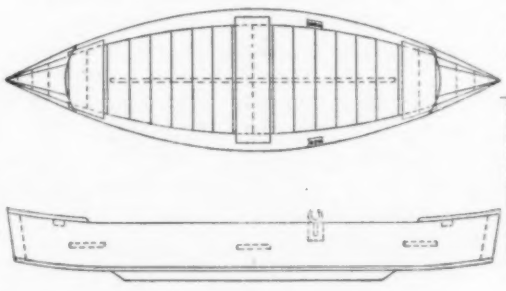


FIG. 3

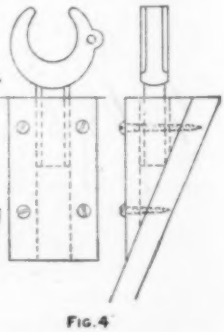


FIG. 4

The Skiff is Especially Constructed for Use in Shallow Water and Marshes by Duck Hunters, but with the Addition of a Keel It Makes a Good Craft for Almost Any Water as a Rowboat

wide, but 12-in. planks may be used, the length being 12 ft. 4 in. Two stem pieces are constructed as shown in Fig. 1, and the plank ends are fastened to them with screws. Nail a crosspiece on the plank edges in the exact center, so as to space the planks 34 in. apart, as shown in Fig. 2; then turn it over and nail another crosspiece in the center of the planks for width, and make the spacing of the other edges 40 in. Plane the lower edges so that, in placing a board across them, the surfaces will be level. The floor boards are 6 in. wide and fastened on crosswise, being careful to apply plenty of red lead between all joints and using galvanized nails, 2 in. long.

A deck, 18 in. long, is fastened on each end, as shown in Fig. 3. It is made of strips fastened to a crosspiece. The seats, or thwarts, consist of 10-in. boards, and are placed on short strips fastened to the side planks about 5 in. from the bottom. The oarlocks are held in a wedge-shaped piece of wood, having a piece of gas pipe in them for a bushing, the whole being fastened at the upper edge of the side planks with screws, as shown in Fig. 4. The location of these must be determined by the builder.

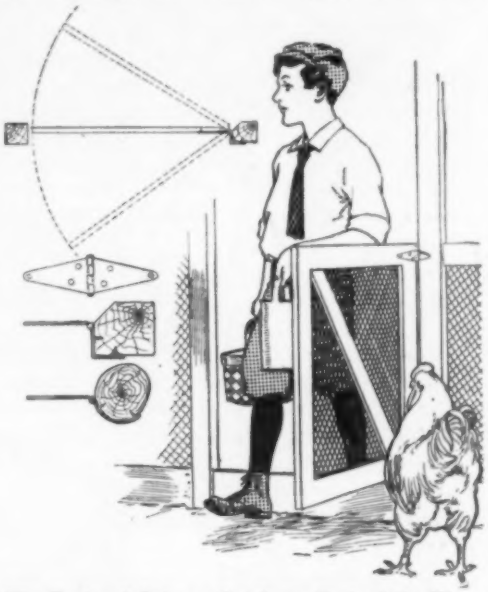
Some calking may be required between the bottom, or floor, boards, if they are not nailed tightly against one another. The calking material may be loosely woven cotton cord, which is well forced into the seams. The first coat of paint should be of red lead mixed with raw linseed oil, and when dry any color may be applied for the second coat.

While, for use in shallow water, these boats are not built with a keel, one can be attached to prevent the boat from "sliding off" in a side wind or when turning around. When one is attached, it should be ¾ in. thick, 3 in. wide, and about 8 ft. long.—Contributed by B. Francis Dashiell, Baltimore, Md.

¶An aniline color soluble in alcohol, by adding a little carbolic acid, will hold fast on celluloid.

Double-Swing Gate with Common Hinge

Ordinary hinges can be easily bent and so placed on posts that a gate can be swung in either direction. As

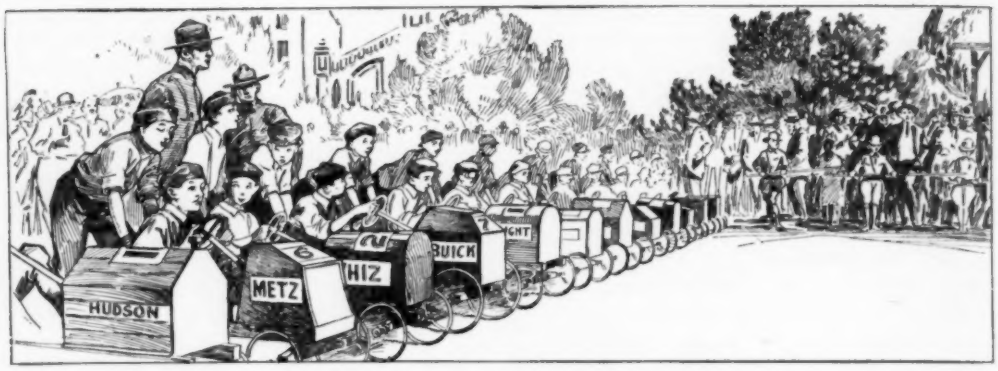


The Post and Gate are Cut Away Back of the Hinge to Allow the Latter to Swing Back

shown in the illustration, hinges can be made to fit either round or square posts. The gate half of the hinge is fastened in the usual way. The post half is bent and so placed that the hinge pin will approximately be on a line between the centers of the posts. The gate and post should be beveled off to permit a full-open gateway.—Contributed by R. R. Schmitz, Birmingham, Ala.

Testing Out Induction Coils

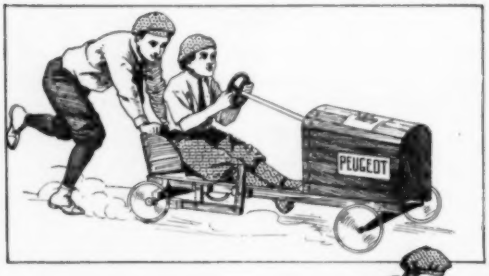
While winding an induction coil, I found it necessary to test the sections for continuity. Having no galvanometer, I connected a battery and low-resistance telephone receiver in series with the section and battery. The battery and telephone receiver may also be used for testing out the secondary of an induction coil, to determine if it is burnt out.—Contributed by John M. Wells, Moosomin, Can.



Cars Lined Up Ready for the Start and the Course Patrolled by the Boy Scouts, All Traffic being Halted for the Race and the Roadway Made Clear for the Entire Half Mile of Track

A Pushmobile Race

Pending the time set for a 500-mile international automobile race that was scheduled to take place several weeks later, a number of boys in the sixth and seventh grades of a public school were enthusiastic over the idea of building



for themselves, in the school shops, pushmobiles and having a race meet similar to the large one advertised.

The pushmobiles were made and the race run as an opening feature of a field meet held in the city. The course was about a half mile long, and was chosen to give the contestants plenty of curves, a part of the run being over brick streets and the final quarter on the regular track where the field meet was held.

Interest was added to the event by petitioning the mayor of the city for a permit to run the race, and the Boy Scouts patrolled the route, while the city policemen cleared the streets, and during the race all traffic was halted.

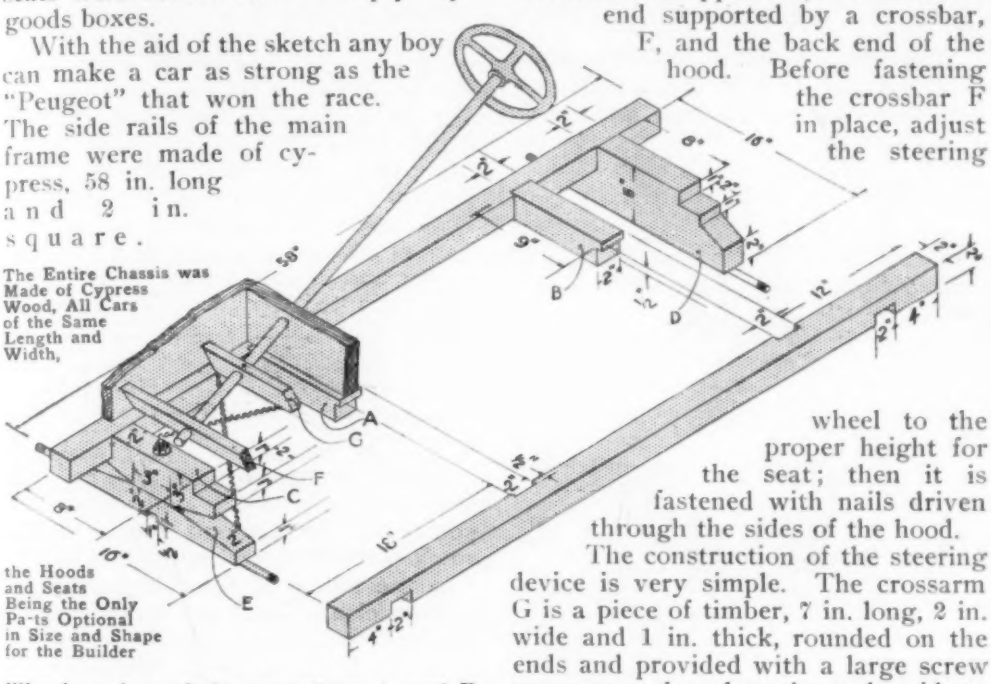
Two of the requirements for entering the race were that the car had to be made in the school shops and that it must have a certain kind of a wheel, which in this case was one condemned by a local factory, thus making the wheels and wheel base of all cars alike. Two boys to a car constituted a racing team, and during the race they could exchange positions at their pleasure. The necessity of "nursing" their cars down the steep grades and around difficult corners developed into an important factor. All cars were named and numbered.

The car that finished first was disqualified for the reason that it took on a fresh pusher along the course.

The Cars Winning the First, Second and Third Prizes Respectively, the "Hoosier" being Penalized 10 Yards at the Starting Tape for Having Larger and Better-Grade Wheels

The cars were constructed under the supervision of the regular shop instructor, and a drawing was furnished each boy making a car. The design of the hood and the arrangement of the seat and steering gear was left for each boy to settle as he desired. The matter of expense was watched closely by each one. Most of the hoods and seats were constructed of empty dry-goods boxes.

With the aid of the sketch any boy can make a car as strong as the "Peugeot" that won the race. The side rails of the main frame were made of cypress, 58 in. long and 2 in. square.



The Entire Chassis was Made of Cypress Wood, All Cars of the Same Length and Width, the Hoods and Seats Being the Only Parts Optional in Size and Shape for the Builder

The location of the crossbars A and B is very important, as they give rigidity to the frame and reinforce the two bolsters C and D. The size of the hood and the location of the seat determine where they should be set into the rail, after which they are fastened with large wood screws. The three bolsters C, D, and E are cut from regular 2 by 4-in. stock. Be careful to get a uniform distance between the rails when they are framed together. If desired, the dimensions can be increased, but do not reduce them, as this will narrow the tread too much. The bolt connecting the bolsters C and E is a common carriage bolt, 5 in. long and ½ in. in diameter. A washer is placed between the pieces C and E, to make the turning easy.

Two pieces of ½-in. soft-steel rod were used for the axles, a hole being drilled near each end for a cotter, to hold the wheels in place, and also holes through the diameter between the wheels, for 1½-in. screws to fasten the axles to the bolsters.

The steering wheel is constructed of a broom handle with a small wheel fastened to its upper end, and the lower end supported by a crossbar, F, and the back end of the hood. Before fastening the crossbar F in place, adjust the steering wheel to the proper height for the seat; then it is fastened with nails driven through the sides of the hood.

The construction of the steering device is very simple. The crossarm G is a piece of timber, 7 in. long, 2 in. wide and 1 in. thick, rounded on the ends and provided with a large screw eye near each end on the under side to which are fastened the ends of two small-linked chains. The chains are then crossed and fastened to the bottom bolster in front and as near the wheels as practical. The connection is made with a screw eye similar to the one used in the crossarm. Another type of steering device may be made by building on the rod a 5-in. drum which takes the place of the steering arm. It is a more positive appliance, but is somewhat harder to make and adjust.

The making of the hood and the seat completes the car. Decide upon the shape and size of the hood, but, in any case and irrespective of the size, it will require a front and back end. These are made first and then secured at the

proper distance apart with two side rails. These two ends are nailed on the ends of the connecting rails. It is then well to fasten the hood skeleton to the car frame and cover it after the steering device is in place.

The seat bottom is cut the shape desired, and fastened to the rear bolster and crosspiece, first placing a piece of the proper thickness under the front edge, to give it the desired slant backward. The back curved part can be formed of a piece of sheet metal and lined on the inside with wood pieces, or with cloth or leather, padded to resemble the regular cushion.

Pencil Rack

The simple pencil rack shown in the sketch can be easily made from any suitable strip of metal, preferably

A Strip of Sheet Metal Cut and Clips Formed to Make a Pencil Rack

brass of about No. 15 gauge. Mark off a number of rectangles corresponding to the number of pencil holders desired. With a sharp chisel, cut through the metal on three sides of each rectangle, leaving one of the short sides untouched. The loose laps can then be bent to a shape suited to hold a pencil. The rack can be fastened in place with nails or screws through holes pierced at each end. —Contributed by Mark Gluckman, Jersey City, N. J.

¶Indistinct but not entirely worn-off dates on coins may be read by heating slightly.

Reducing Size of a Hat Sweatband

Very often a hat has been worn for some time and it becomes too loose on the head, then paper is used in the sweatband to reduce the size. A better, easier, and neater method, as well as one that will be cooler for the head, is to insert a flat lamp wick inside of the sweatband. Wicks of all thicknesses and widths are easily obtained. —Contributed by Maurice Bandier, New Orleans, La.

A Catapult

The catapult shown in the sketch is one I constructed some time ago and found to be amusing and very inexpensive. The catapult consists of a small piece of dowel or pine, whittled into the shape of a handle, a screw-eye, an elastic band and an arrow. It is surprising how a well-balanced arrow will fly into the sky until lost to sight when propelled through the eye of the screw with a medium-strong elastic. A number of forms of this

The Eye of the Screw Serves as a Guide for the Arrow

simple gun were made, but the one shown is the simplest and most effective.—Contributed by C. A. Needham, New York, N. Y.

Electrical Heating Apparatus for the Home

By ARTHUR MOORE

PART VII—An Electric Shaving Mug

Procure a piece of sheet copper about $\frac{1}{32}$ in. thick, $3\frac{3}{4}$ in. wide, and 13 in. long, and bend it in the shape of a cylinder around a piece of pipe or other cylindrical object, to make it 4 in. in diameter, allowing the joining ends to overlap $\frac{1}{4}$ in. The seam may be fastened with hard solder, but a much better way of making the joint is to braze the ends together. After fastening the joint, true up the ends and expand the edge of one so that it has a form similar to that shown in Fig. 1.

Obtain a piece of thin, soft copper, about 4 in. long and $2\frac{1}{2}$ in. wide, and shape it to fit into the cup, as at A, Figs. 1 and 2, to serve as a receptacle for the soap. To shape this piece it is necessary to hammer the metal, as it is impossible to get it in the proper shape by merely bending. The edge is cut so that it will fit the exact curvature of the inside of the cylinder. A number of small holes are drilled in it so that the water will readily drain out of it into the cup. The piece is placed in position directly opposite the soldered joint in the cup, and is soldered from the under side.

Procure a piece of copper, 4 in. square, and cut a circular piece that will fit very tightly into the lower end of the cylinder, place it about $\frac{3}{4}$ in. from the end, and fasten with hard solder applied from the under side.

The metal for the handle should be about $\frac{1}{16}$ in. thick and shaped as shown in Fig. 3. The piece is bent so that it forms a handle as shown in Fig. 1. A $\frac{1}{8}$-in. hole is drilled in the upper end and two $\frac{1}{8}$-in. holes in the lower end. The broad portion of the handle may be curved, as shown at B, Fig. 2, by hammering the edges and expanding them. Place the handle in position on one side of the cylinder, then mark the holes and drill them with a $\frac{1}{8}$-in. drill in the cylinder, and fasten the handle with rivets. If the holes are slightly countersunk on the inside, the rivet ends can be hammered down and filed perfectly level with the inside surface.

The base of the cup may be spun or hammered from a piece of thin copper, in the shape shown in Fig. 1. A bottom is provided for this base as shown at C, which is held in place by the ends of four rivets, D. Notches are cut in the edge of the bottom C to allow it to pass the rivet ends, after which a slight turn one way or the other will fasten it firmly in place. Cut or drill a hole in one side of the ring forming the base, and provide a suitable insulating bushing, E, so that an ordinary piece of lamp cord will pass through the opening into the inside of the base.

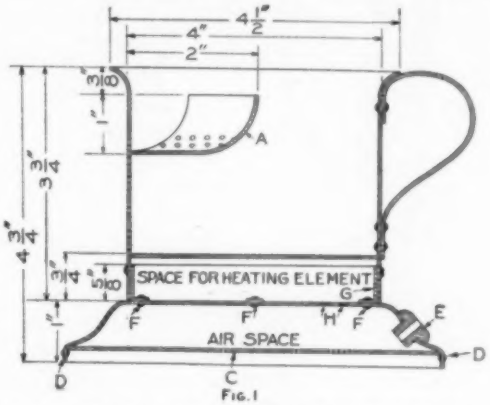


Fig. 1

A Cross Section of the Complete Cup, Showing the Parts and Their Location

Form a cylinder, $\frac{5}{8}$ in. long and having an outside diameter just a little less than the inside diameter of the cylinder forming the cup, from some thin sheet copper. Make four small lugs on one end and bend them in at right angles to its axis. The cylinder, or ring, is fastened in the exact center of the top of the base, with four small rivets, as shown at F.

Drill four $\frac{1}{8}$-in. holes in the lower end of the cylinder forming the cup, at equal distances apart and about $\frac{3}{8}$ in. from the lower end. Place the cup in position on the base with the handle directly over the bushing for

the cord, and mark the positions of the four holes in the cylinder G, then drill and tap them to take small machine screws. If possible, place the cylinder

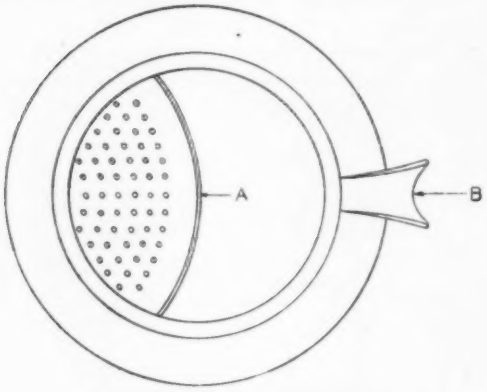


FIG. 2

The Soap Holder and Its Position in the Cup Relative to the Handle

G on the base so that the lugs F will be directly under the screws holding the cup in position on the base.

Drill two $\frac{3}{16}$-in. holes, H, in the top of the base, through which the leads connecting the heating element to the lamp cord are to pass. This completes the mechanical part of the cup and base, which are now ready to be thoroughly cleaned and have all rough edges filed smooth, whereupon they are buffed, and nickel or silverplated.

The heating element occupies the space marked for it in Fig. 1, and, of course, must be circular in form so that the heat will be fairly well distributed over the entire under surface of the cup. A very simple form of heating

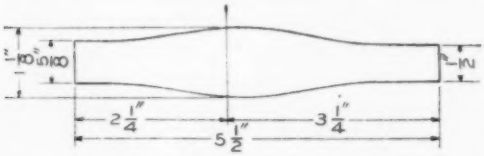


FIG 3

The Bulged Part of the Handle Permits Its Shaping for an Easy Grip

element, having only one degree of heat, is made as follows: Procure a piece of sheet mica, about .01 in. thick and of such a size that a disk having a diameter equal to the inside diameter of the cylinder G may be cut from it. Mark a circle on the disk having a radius not quite $\frac{1}{8}$ in. less than the radius of the disk, and then draw a number of parallel lines across it, $\frac{1}{8}$ in. apart, starting with a line drawn directly through the center. Drill $\frac{1}{16}$-in. holes through the mica at the points of intersection of the parallel lines and the circle, then cut a small slot from each of the holes to the outer edge of the disk. Procure 14½ ft. of bare, No. 28 gauge nichrome resistance wire and mark the center of it, then wind it around a hatpin to form a spiral. Starting at the center of both wire and disk, stretch out both the wire ends and wind them back and forth across the mica disk. The wire should pass down through one hole, then along the edge of the mica and up through the next and back across to the other side, which results in practically all the wires being on one surface of the disk. The terminals of the winding will be on opposite sides and the winding may be terminated, or the ends held in place, by lacing the ends back and forth through several holes very near the edge. An exaggerated sketch of a portion of the winding is shown in Fig. 4, which will give some idea of the arrangement suggested.

Two short pieces of No. 16 or 18 gauge asbestos-covered copper wire, about 5 or 6 in. long, are procured, and one end of each of these pieces is securely attached to the two ends of the resistance wire forming the heating element, by twisting them together, or by means of a very small bolt. These joints are then insulated with some asbestos or other heat-resisting insulation.

Obtain a piece of lamp cord, 8 or 10 ft. long, and provide an attachment plug on one end, then pass the other end through the insulating bushing in the base of the completed cup. A knot is made in the end of the cord, inside the base, to take care of any strains, and the insulation is removed from the two wires for a distance of at least 1 in. The ends of the lamp cord and the ends of the asbestos-insulated leads are twisted together, soldered, and taped,

or insulated with a piece of asbestos, or other suitable, sleeving, which may be slipped over one end of the wire before the joint is made, and then back in place after the joint is complete.

Fill the space inside of the cylinder G, Fig. 1, with asbestos wool to such a height that the heating element will be held firmly against the under side of the cup bottom when it is placed in position. Before putting the cup cylinder in place, a thin sheet of mica is placed on the under side of the bottom of the cup, so that the heating element will not come in contact with the metal bottom of the cup.

The heating element will take about 200 watts, and will heat a pint of water to the boiling temperature in about 15 minutes. The arrangement of the heating element can be improved by dividing it into two sections, each giving a different degree of heat alone and the two combined giving the maximum heat. The same size wire, of course, could not be used if this change is made, but the calculating of the copper size to use and the arrangement of the windings will need to be worked out by the builder. Many times, more satisfactory results are obtained by experiment than by calculation.

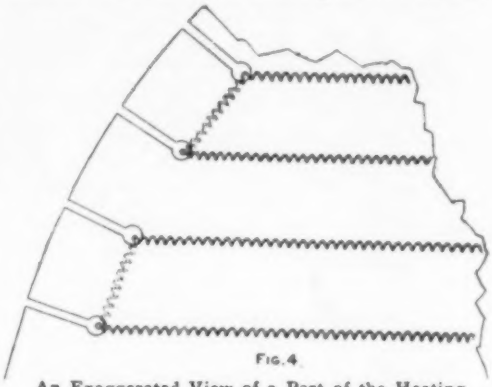


FIG. 4

An Exaggerated View of a Part of the Heating Element, Showing Its Construction

Feeding Geese in a Poultry Yard

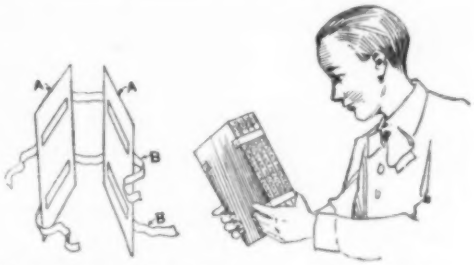
Having four geese in a yard with chickens, I found that the chickens would not allow the geese to pick up the food. To feed the geese I placed the corn in the bottom of a pan and filled it with water. The geese will easily pick up the corn from under the water, where the chickens would not attempt to touch it.—Contributed by Walter L. Kaufmann, Santa Ana, Cal.

Temporary Binder for Magazines

The sketch illustrates an inexpensive temporary binder for periodicals, magazines, newspapers, etc. It consists of four parts, namely, two sheets of cardboard, A, the size of the magazine to be bound, and two pieces of linen or tape, B. A slot is cut in each corner of the cardboards about 1 in. from the edge. The tape is run through these slots in the manner shown.

The magazine numbers, as they are received, are placed on the back cardboard, building them up consecutively as they come. The ends of the tape are tied to hold them together. The backbone is open and the contents are readily seen.

The sliding of the tape in the slots provides a means of holding from one to as many copies as may be desired, and they are kept in good condition until a complete volume is compiled, when a more permanent binder can be made.



The Binding is Only Temporary to Keep the Magazines in Good Condition for a Complete Volume

Instead of tape a leather strap can be used with a buckle. The tapes can be fastened to one of the cardboards, allowing one end only to be movable. —Contributed by Pierre Wagner, Indianapolis, Ind.

INTERESTING NEW PATENTS

FIG. 1

SILK-WOUND STEEL FISHING ROD (Fig. 1)—Each section is closely wound with silk thread, and over this a coating of shellac, or other waterproof composition, is placed. The purpose is to protect the steel from corrosion as well as to strengthen the rod and prevent its opening at the seams. Weak points in the joints are strengthened by additional windings of the silk.

FIG. 3

GARDEN SHEARS (Fig. 2; American patent to a Canadian)—This device consists simply of a pair of garden shears carried on wheels and provided with upright handles by which it may be operated without the necessity of stooping. The pivot of the shears is attached to a triangular plate that is supported by the wheels, while the handles are equipped with sliding joints by which they may be raised or lowered to suit the convenience of the user.

FIG. 2

SWIMMING APPARATUS (Fig. 3)—With this curious apparatus the swimmer propels himself through the water by alternately pulling and pushing on the handlebars attached to the upper end of the pivoted bar. At the lower end of this bar are two hinged paddles which open when moved backward and fold together when moved forward. From the pivot a horizontal bar runs back past one side of the body. To this bar, which terminates in a small rudder, floats for supplying the necessary buoyancy are attached, the whole apparatus being securely fastened to the body by straps.

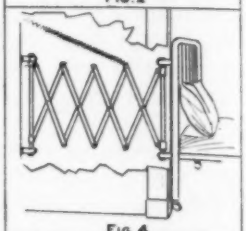


FIG. 4

DISAPPEARING BED (Fig. 4)—This device consists of an ordinary collapsible bed combined with a lazy-tong extensible arm. One end of the arm is attached to the bed, while the other is pivoted to the inner wall of the closet, or other recess, in which the bed is placed when not in use.

FIG. 5

COMB WITH RECEPTACLE FOR TOOTHBRUSH (Fig. 5; British patent to an American)—The back of the comb is tubular in form and contains a receptacle of the proper size and shape for a toothbrush. The end of this receptacle is closed by a screw cap.

FIG. 6

DUSTPAN ATTACHED TO BROOM (Fig. 6)—This device is evidently intended to be dragged about the floor as sweeping progresses. It consists simply of a dustpan that is so shaped as to receive sweepings when set flat on the floor, with a strap for connecting it flexibly with the broom. The strap is attached to the broom by a ring that slips over the broom handle.

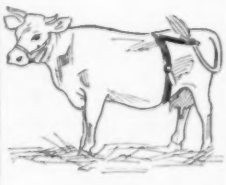


FIG. 7

COW-TAIL HOLDER (Fig. 7)—This holder, which is designed for preventing the cow from switching her tail while being milked, consists of a strap which is fastened around the body, to which is fixed a second strap that carries on its free end a clamp for holding the tail securely. This device is placed as shown, so that the tail is drawn up over the back.

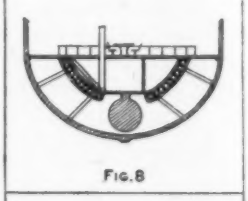


FIG. 8

SELF-LEVELING FLOOR (Fig. 8)—The floor is supported on the main structure by roller bearings and is held in level position by the action of a weight rigidly suspended from the bottom of the framing. The device is apparently intended to be installed on ships for minimizing or preventing the effects of rolling.

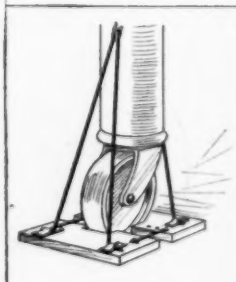


FIG. 9

CASTER STOP (Fig. 9)—The two clamping plates are suspended by wires from hooks in the caster leg. When hanging free they do not interfere with the movement of the caster, but when drawn together by the hooks, as shown, they clamp the caster roller and prevent any movement. Each plate is provided with a recess that fits closely over the rim of the roller.

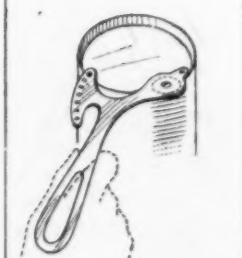


FIG. 10

CAN OPENER (Fig. 10; American patent to a Swiss)—This opener, which is adapted only to cans having a beaded seam, removes the whole top of the can by cutting around the side, the cutter working around the can just under the top. The cutter wheel is held in place by the adjacent pin and by one of the tines at the left of the tool, both of which hook over the beaded top of the can. The tines are arranged to provide for cans of various sizes.

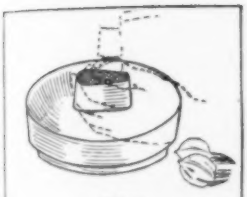


FIG. 11

NUT-CRACKING DEVICE (Fig. 11)—This device consists of a bowl, in the center of which a small anvil with hammer surface is fixed. It is made of strong but light material and is intended to be held in the lap.

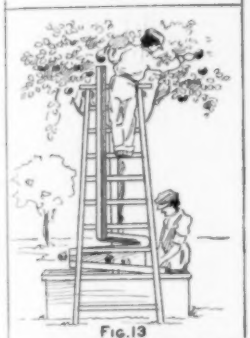


FIG. 13

WINGS FOR STEADYING LIFEBOAT (Fig. 12)—Each wing is semicircular in form and is hinged at the top to the gunwale of the boat. The device is intended for use in heavy seas, with the idea that the wings will spread out on the surface and protect the boat from swamping or capsizing.

FRUIT PICKER'S LADDER AND SORTING TUBE (Fig. 13)—The fruit is dropped as picked into the top of the tube, falls to the first inclined tube extending to the right, and then rolls into the next tube below, which is the sorting tube. The larger fruit is discharged through the opening of this tube at the left, while the smaller fruit falls through a slot in the bottom and through a space inclosed by longitudinal walls into the lowest tube, where it is discharged through the opening at the right.

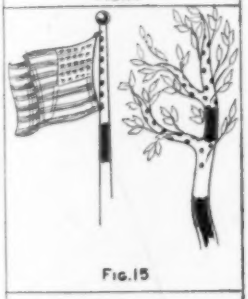


FIG. 15

CORNET (Fig. 14)—This cornet is designed to provide a constantly expanding space for the vibrations as they traverse the pipes from the mouthpiece to the bell, with the idea of producing tones of superior quality. The pipes gradually increase in diameter as the bell is approached, and this regular increase is not interrupted by cylindrical sections such as occur in the ordinary cornet. The interchangeable U-shaped pieces enable the player, by substituting one for the other, to raise or lower the pitch of the instrument one-eighth of a tone.

DEVICE FOR IMITATING WIND EFFECT (Fig. 15)—This display device is intended to produce the same effect as that of a breeze blowing a flag or the leaves of an artificial tree, and is apparently designed to be used in theaters and banquet halls. The flagpole, or the trunk and branches of the artificial tree, are made hollow and are provided with small orifices through which the artificial breeze issues. Air is supplied through the bottom of the device by connection with a fan or a compressed-air reservoir.

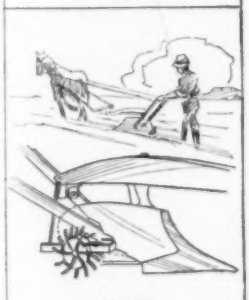


FIG. 17

GAME TARGET (Fig. 16)—This curious target is made roughly to the shape of a bird and is suspended on a flat hook as shown. The hook is so shaped that the target falls to the ground when struck by a bullet or hand-thrown projectile.

PLOW WITH SPADING ATTACHMENT (Fig. 17)—This attachment consists of a rotating disk to the ends of which a series of spading prongs are pivoted. The attachment is fixed to the rear of the plow by a pivot at the forward end and a spring connection at the rear end. Resiliency is given the prongs by springs that keep them normally bearing against lugs in the end of the disk, while the lugs are arranged in such a way as to permit a considerable amount of movement against the springs.

FIG. 19

SHIP WITH FLOATABLE UPPER DECKS (Fig. 18; British patent to an American)—This curious construction is intended to assure the safety of passengers at sea. The hull is made with double walls, and on the hull the upper section, which is water-tight, is seated without being permanently attached. The idea is that if the hull sinks, it will simply drop away and leave the upper section floating.

SELF-FASTENING HASP (Fig. 19)—The construction is the same as that of the ordinary hasp except that the hook is split and formed into two springs with projecting shoulders. These shoulders, combined with the action of the springs, hold the hook securely in place when thrust into the ring.

VENTILATED HAT (Fig. 20)—This hat is provided with perforations in the crown and, in addition to this, has a strip with vertical flutings placed between the sweatband and the body of the hat. The sweatband is turned under the lower edge of the fluted strip and is perforated, the purpose being to permit a free circulation of air through the flutings and out through the perforated crown.

FIG. 12

FIG. 14

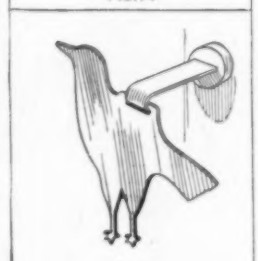


FIG. 16

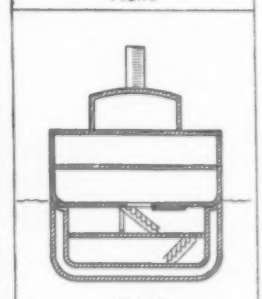
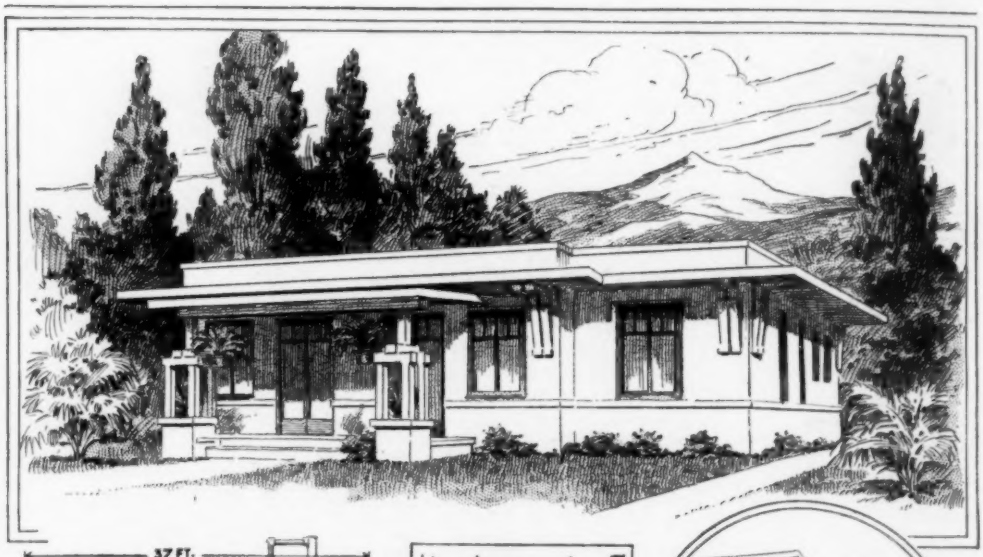


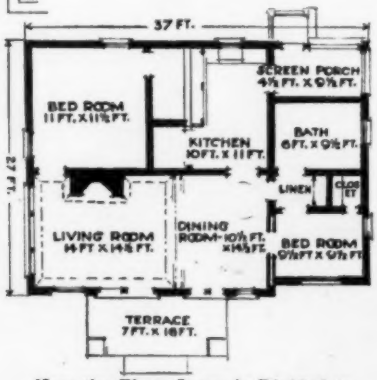
FIG. 18

FIG. 20

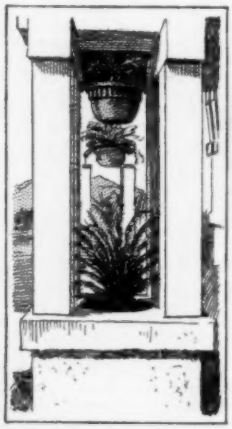
November 15 Cents

TYPICAL CONCRETE BUNGALOW OF CALIFORNIA

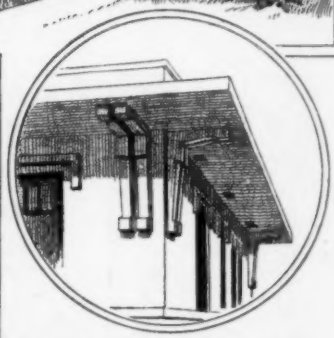




How the Floor Space is Divided to Produce a Compact and Convenient Arrangement of Rooms



At Left: One of the Porch Columns with Its Inclosed Flower Holders



Above: The Projecting Eaves Supported by Concrete Brackets

BUNGALOWS built of concrete are fast coming into vogue in southern California to replace buildings of this class with walls of stucco laid on wooden or metal lath, and the bungalow shown in these illustrations is a good example of the results that can be obtained at moderate cost with this permanent form of construction. This building contains five rooms, bath, and screened porch, and was built at a cost of $2,600. The exterior walls are 8 in. thick, consisting of two layers of concrete with an intermediate air space, while the roof is of composition material, and has a pitch of only ½ in. to the foot. The eaves extend 4 ft. beyond the walls, and while amply strong to be self-supporting, are given the required appearance of stability by concrete brackets. Both the type of building and the materials used lead naturally to quaint and pleasing effects. The exterior of the bungalow has a sanded finish, while the exterior woodwork is stained dark, to produce a pleasing contrast with the cement surfaces. The front porch has a beamed ceiling, and is supported at the outer corners by concrete piers.

This bungalow has two front entrances, both of French type. One of these leads to the living room, which is the largest room in the house and has hardwood floor, tinted ceiling, and walls tinted with a scenic border, with wood baseboard and cornice. There is a double-casement window at the front, and a series of windows of this type at the side of this room. Between this room and the dining room are buttresses extending 4 ft. from the walls, and a cased beam that spans the opening and projects down to the level of the top of the doorway. The dining room also has hardwood floor with walls and ceiling in much the same style as those of the living room. Both rooms have indirect lighting. The dining room is separated from the front bedroom by sliding doors, which disappear within the wall on each side when opened. Both the bedrooms have Oregon-pine floors, papered walls, and tinted ceilings. The bathroom is finished entirely in white, the 5-ft. wainscoting being white-enameled. The kitchen is modern in all particulars, having a cement-stone sink board, cement hood for the gas stove, and a spacious but compactly arranged set of cupboards and drawers.